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- Traveling Mattes In Color
- Production Value For Industrial Films
- Disney's First Non-cartoon Animated Film

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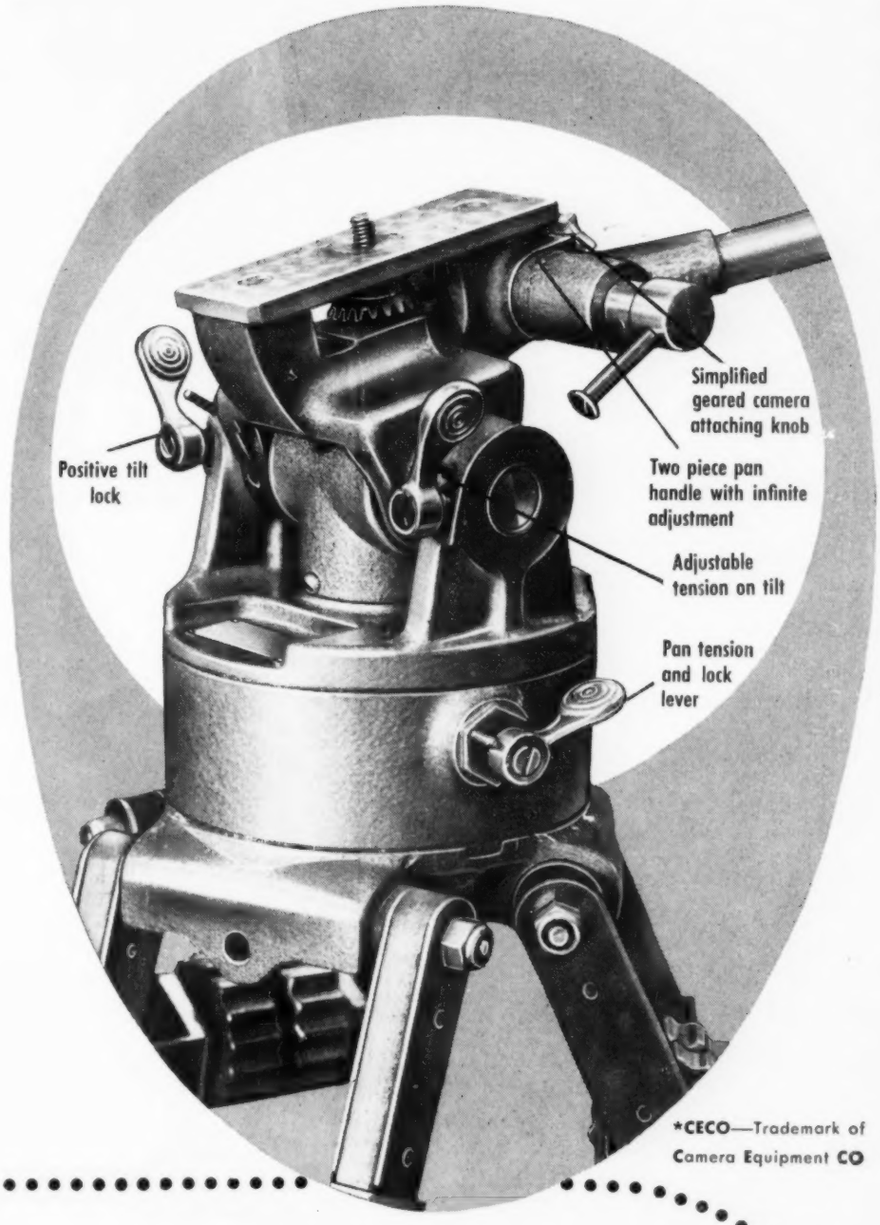
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Two piece pan handle with infinite adjustment
Adjustable tension on tilt
Pan tension and lock lever

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You'll find yourself getting smoother pan and tilt shots, with smooth-as-silk maneuverability when you use the incomparable CECO FLUID HEAD. Works under any conditions with complete versatility.

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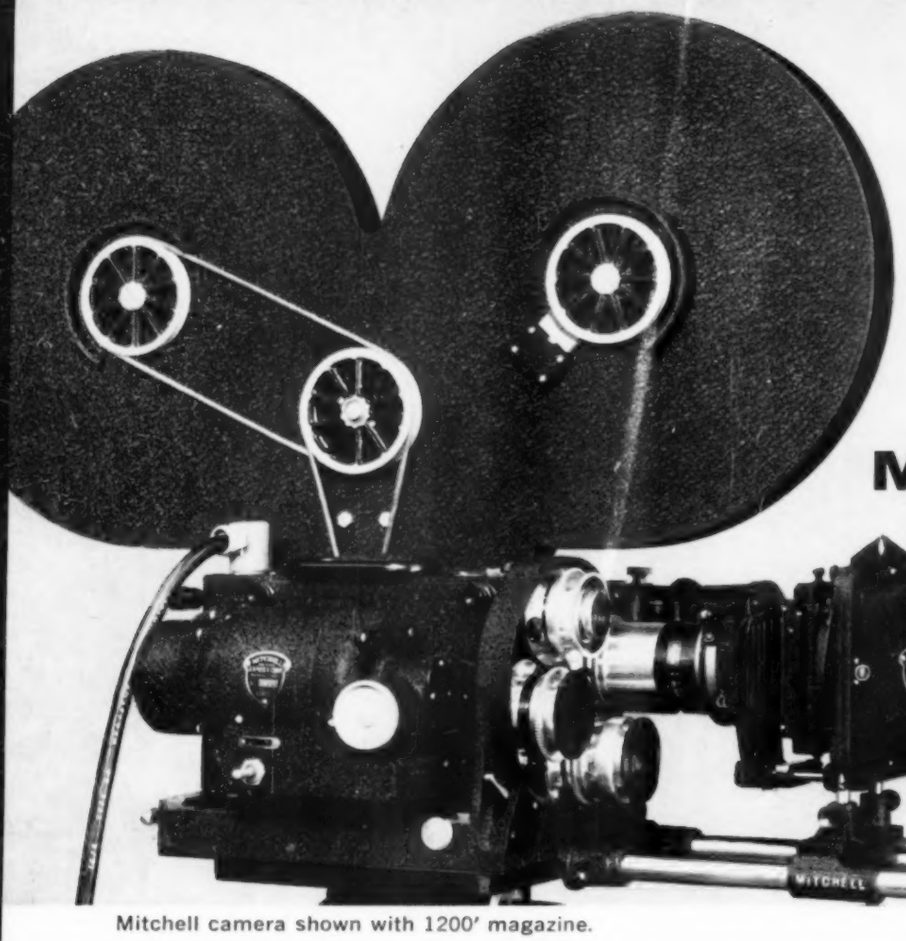

WORLD'S MOST FLEXIBLE MOTION PICTURE CAMERA

Mitchell camera shown with 1200′ magazine.

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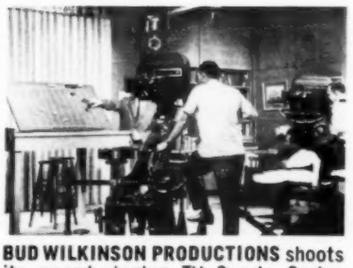
No other motion picture camera is today used for such a broad range of exacting film making as is the Mitchell. The versatile speed of the camera, ranging from 1 to 128 frames per second, plus 14 exclusive features equip the Mitchell for an impressively broad range of cinematography. A single Mitchell can meet the requirements for finest quality TV commercials, feature productions, public relations, sales and training films, progress and report films, plus critical research and development data and record photography.

Mitchell cameras include: 35mm and 16mm cameras; 70mm 2¼ x 2¼ high speed cameras; and 70mm, 65mm and standard aperture cameras.

For information, write on your letterhead—please indicate which model camera your request concerns.

GENERAL ELECTRIC uses Mitchell for wide range of work, including slide films.



BUD WILKINSON PRODUCTIONS shoots its award-winning TV Sports Series with the Mitchell.

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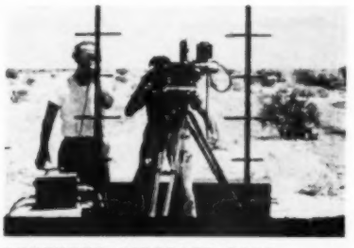

LOCKHEED AIRCRAFT CORP., uses Mitchells continuously throughout plant, here records jet flight.

**85% of All Professional Motion Pictures Shown Throughout the World Are Filmed with Mitchell Cameras*

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AMERICAN
Cinematographer
November, 1959 • Vol. 40, No. 11

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ON THE COVER

THE FAMOUS Mendenhall Glacier near Juneau, Alaska, and the iceberg-dotted lake fed from it forms background for love scene with Ray Danton and Diane McBaine for Warner Brothers' "Ice Palace," photographed by Joseph Biroc, A.S.C., in center foreground, holding meter. Others, from left, are: Gil Kissell, assistant director; George Nogle, operative cameraman; Elmer Faubian, assistant cameraman; and Director Vincent Sherman.

•*Feature Articles*

NEW, FAST REVERSAL COLOR FILM 660
New Eastman motion picture film offers commercial producers high-speed material for color productions.

SEVEN SCREENS FOR MOSCOW 670
How America's unique multiple-screen film presentation for the Moscow Fair was conceived, produced and staged. By Herb A. Lightman.

COLOR IN MOTION PICTURES AND TV—Part III 672
New problems arise when color productions are filmed in the usual way for exhibition on television. By Robert Allen Mitchell.

TRAVELING MATTES IN COLOR 676
The sodium lamp method employed in British studios utilizes panchromatic film for the matte negative. By Robert L. Hoult.

"NOHA'S ARK"—WALT DISNEY'S FIRST NON-CARTOON ANIMATED FILM 680
Industry's foremost animation studio tries a new tack in animated entertainment films, with high success. By Arthur Rowan.

2-MIKE CONVENIENCE WITH A 1-MIKE AMPLIFIER 685
How the single-channel Cine-Voice amplifier was modified to handle two microphones for newsreel work. By George J. Yarbrough.

MOTION PICTURE CAMERAS: THE AURICON PRO-600 688
Description of salient features of a versatile, lightweight single-system sound camera that is ideal for in-plant industrial film production as well as newsreel filming.

INDUSTRIAL FILMS NEED PRODUCTION VALUE, TOO 690
How the same quality given feature films can enhance business and industrial films for greater audience appeal. By Darrin Scot.

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News briefs of industry activities and progress.

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Things that are new for makers of motion pictures.

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Where and what TV and feature cameramen were shooting last month.

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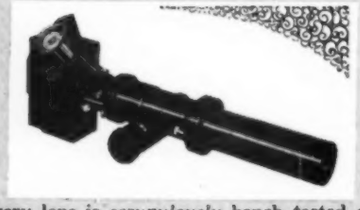
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INDUSTRY NEWS

News briefs of industry activities, products and progress

Credit Lines for TV newsfilm cameramen have been instituted by KAKE-TV, Wichita, Kansas. On the sound and sensible principle that outstanding achievement deserves recognition, the station has been carrying a visual credit line on noteworthy newsfilm. Credit slides are made up for all staff cameramen's names as well as for 85 of the station's camera correspondents. While film is on the air the credit line is superimposed for a 5-second period, reports *National Press Photographer* magazine.

• • •

Church Film Market — The nation's over 300,000 churches offer a tremendous market for religious films, and there are at present more than 60,000 churches regularly showing religious films, according to Ben O'Dell, executive of Cathedral Films, Hollywood.

Speaking before members of the A.S.C. at their October meeting, O'Dell, who is also an executive of the California Bank, which makes loans to motion picture producers, said that the name and reputation of the camerman engaged for a production has always been a vital factor considered in producer's loan applications — indicating the importance one of the nation's leading banks places on the men who shoot Hollywood's feature films.

• • •

High Speed Cinematography played a big part in the research and development of the high-speed dental drills recently announced by the University of Southern California. The new drills not only do their work more quickly and more efficiently but also more quietly. The drill's rotary action is so rapid that many people cannot sense it.

The Beckman & Whitley Model 189 high-speed Framing Camera was utilized by USC's Dr. Tanner to photograph the cutting action of dental burrs in tests. The pictures obtained were most enlightening and should result in a better understanding of the cutting process. Thus dental researchers can design more efficient devices aimed to ease the vibration and pain that once was associated with dentistry.

• • •

TV For In-Plant Filmers—Two recent Industry Film Producers Association meetings in Southern California have featured an examination of closed-circuit TV in in-plant motion picture activities.

IFPA members were guests of General Precision Laboratories in Pasadena where they were shown a variety of industrial TV cameras and equipment.

A second meeting was held at the Telefilm Studios in Hollywood where there was further discussion on television and other uses for industrial films, followed by a demonstration of video-tape recording and playback at station KTTV, Hollywood.

The IFPA has invited all in-plant film departments with members in its association to submit their best films for the forthcoming Third Annual IFPA Awards.

• • •

Resolving power has been found unsuitable as a criterion of quality for lenses and photographic emulsions, Fred Perrin, of Eastman Kodak Company, said at the 86th semiannual convention of the Society of Motion Picture and Television Engineers in New York last month.

"Ever since the lens was invented by the ancient Assyrians," Perrin said, "the quality of lenses and other optical systems, has been judged by their ability to make distinguishable images of extremely fine lines lying very close together. After photography was invented, the quality of photographic films was determined in the same manner."

"Within recent years," he continued, "it has been found that this method of estimating quality is not satisfactory and it might even be misleading. On the other hand, it is sometimes possible to see extremely fine lines with a microscope although the entire picture is unpleasantly fuzzy. On the other hand, another picture might be sharp

Continued on Page 648

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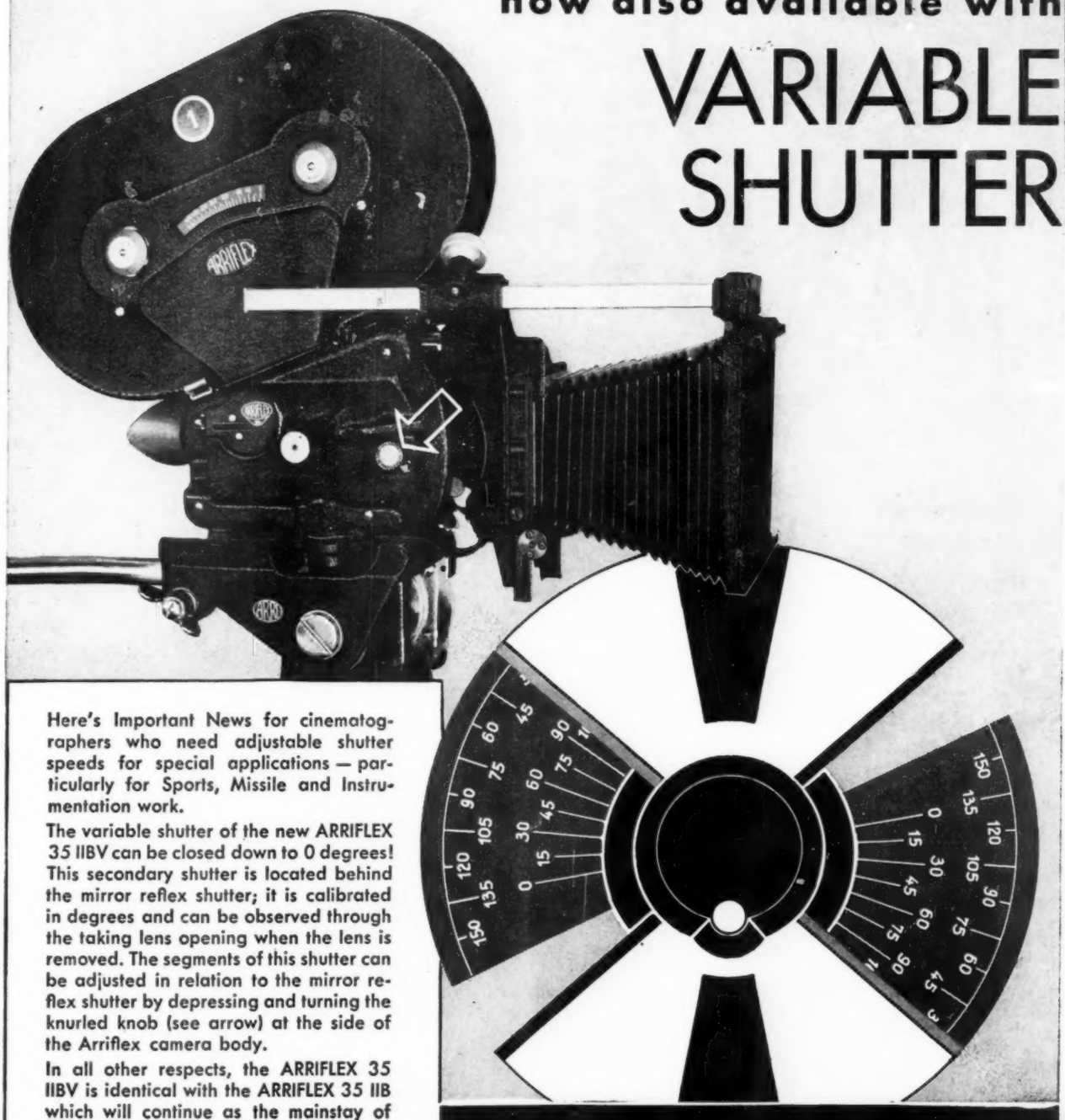

Here's Important News for cinematographers who need adjustable shutter speeds for special applications — particularly for Sports, Missile and Instrumentation work.

The variable shutter of the new ARRIFLEX 35 IIBV can be closed down to 0 degrees! This secondary shutter is located behind the mirror reflex shutter; it is calibrated in degrees and can be observed through the taking lens opening when the lens is removed. The segments of this shutter can be adjusted in relation to the mirror reflex shutter by depressing and turning the knurled knob (see arrow) at the side of the Arriflex camera body.

In all other respects, the ARRIFLEX 35 IIBV is identical with the ARRIFLEX 35 IIB which will continue as the mainstay of the line.

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MODEL UC-35—will accommodate all 35mm movie and T.V. cameras and will take a load up to 150 lbs. in any position.

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INDUSTRY NEWS

Continued from Page 646

and crisp although lines that are fairly well separated may appear to merge together indistinguishably."

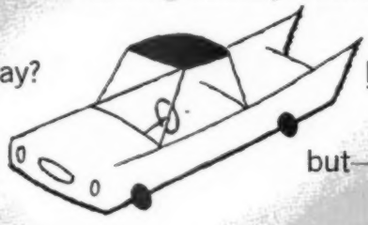
According to Perrin, any picture can be regarded as an assemblage of points and edges; and even an edge can be regarded as an assemblage of points of different brightness. Points of different brightness, he continued, are therefore the building blocks of which any picture is made. The image of a point is always a disk or blob of light whose shape and size depends upon the quality of lens or film. This has been given the name, "spread function," by the mathematicians, he said.

"If the spread function is uniform over its' area" he said, "but has sharp edges, the picture is sharp but will not reproduce fine lines well. If the spread function has a very bright center surrounded by a hazy area, it will make a picture in which fine lines can be seen with the aid of a microscope, but which is blurred when viewed in the ordinary way."

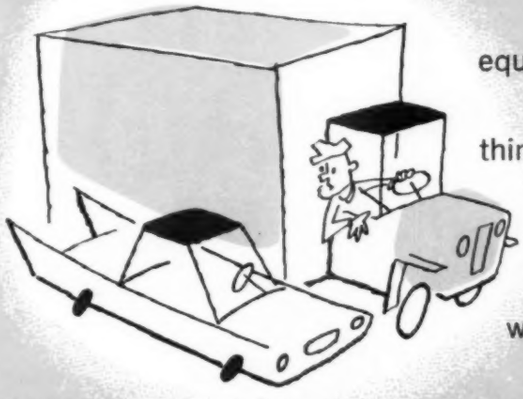
Perrin explained that when a lens and a film are to be combined, as in a camera, it is difficult to predict the quality of the picture from a knowledge of the spread function of the lens and the film alone; and therefore, it is customary to describe spread functions in a different kind of language. "If the quality of a phonograph is to be determined," he said, "a record having a series of pure waves of increasing frequency or pitch is played and the loudness of the sound from the loud speaker is measured at each pitch. The same thing can be done for a lens or a film except that the 'record' is a photograhpic negative having a 'wave' of varying blackness and the quality is measured by finding how clearly the successively finer lines are reproduced. Such a measurement can be made in the laboratory or it can be computed if the spread function is known."

"This feature of lenses and films," Perrin said, "is known as sine-wave response and is now used by laboratories all over the world." He explained that the sine-wave response predicts a curious effect in which a lens sometimes shows a series of bright lines where dark lines should be and dark lines where bright lines should be. Its usefulness in improving the quality of pictures the author showed by a study of a printer used for making motion pictures. "Improvements in the sharpness of pictures resulting from such investigations," he said, "are responsible for the widespread adoption of the modern small cameras." ■

Did that car really drive itself?

Did you catch the commercial showing a driverless car driving blithely down the highway?  It looked driverless but—you guessed it—it wasn't.

A director of a well known producing company had this brainstorm. Terrific, but how do you do it? Our boys worked it out for him. Actually, CECO* experts and technicians are called upon to solve many more complex problems. Think of CECO as headquarters for the world's finest professional photographic equipment—but think of us also when you're wrestling with



a tough idea. Maybe we can help. Try us.

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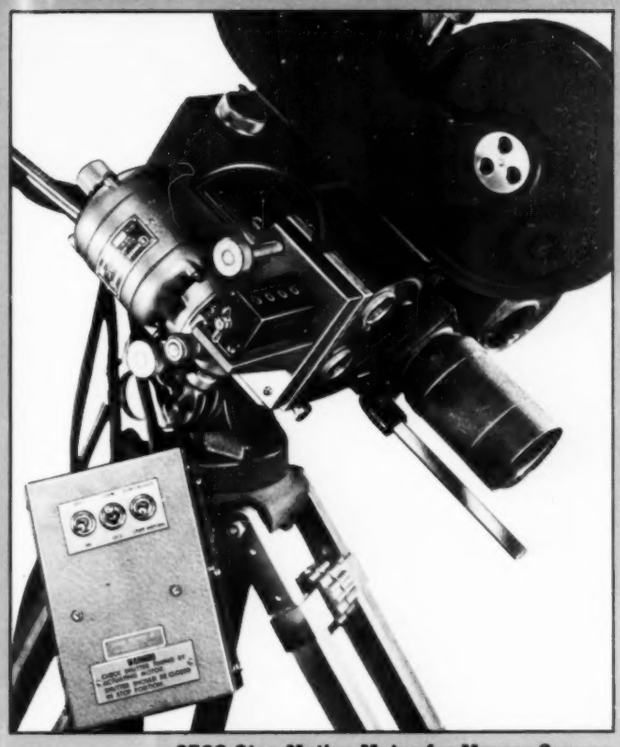

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110 volt synchronous motor. Can be operated single frame or continuous run on forward or reverse. Exposure time: ⅜ second at 170° opening; ⅝ second at 235° opening. Attaches directly to Models 05 and 150. Stop motion motors available for most all other cameras.

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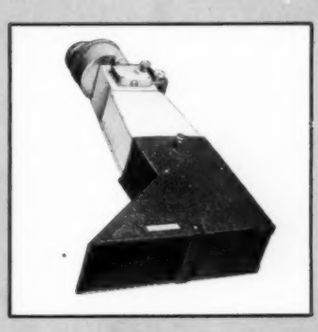

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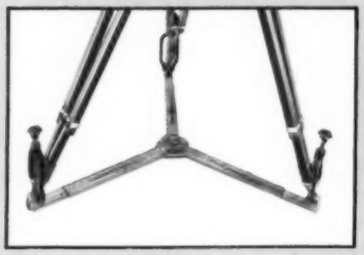

CECO Underwater Housing for Eastman Kodak K-100 16mm Camera

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CECO Blimp for 16mm Maurer Camera

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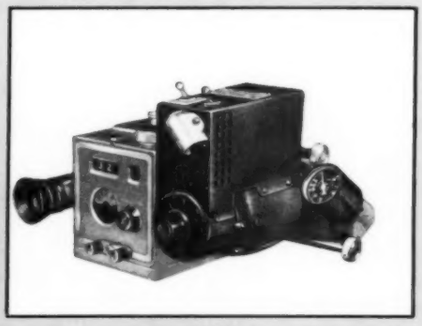

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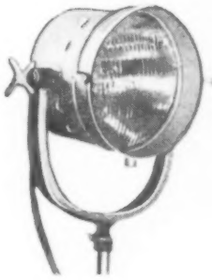

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NEWS AND PICTURES OF THE ASC, ITS MEMBERS AND INDUSTRY PERSONALITIES

ASC honors Arthur Edeson at its October dinner-meeting, marking the fiftieth anniversary of his debut as cinematographer.

HONORED BY THE ASC for his untiring devotion to welfare of the Society, Arthur Edeson, one of the Society's founders, cuts cake at dinner given in his honor last month.

ASC PRESIDENT Walter Strenge, in behalf of the Society, presents engraved memento—a gold currency clip—to Arthur Edelson.

ADMIRING MEMENTO in hands of Arthur Edeson is Charles Rosher, right, now retired and living in Jamaica, who is in Hollywood on one of his annual visits.

HAL MOHR and WALTER STRENGE examine fine points of the latest Pathe-16 camera, which was on display at the ASC's October membership meeting.

Arthur Edeson, one of the founders of the A.S.C., was honored by members of the Society last month at a dinner commemorating the fiftieth anniversary of his entering the motion picture business. Although he no longer is active as a cameraman, Edeson still takes active part in the affairs of the A.S.C. He is a former President of the Society and has served on the Board of Directors.

Following the presentation to Edeson of a gold memento—a currency clip bearing a goldpiece marking his birth year and engraved with the A.S.C. emblem—Arthur Miller, Hal Mohr, Walter Strenge, Ben O'Dell, and Virgil Miller spoke briefly lauding Edeson's untiring devotion over the years to the welfare of the Society and its members.

Edeson, regarded one of the industry's most distinguished cinematographers, has twice been honored by the George Eastman House for his early-day photographic achievements, and has several Academy Award Nominations to his credit.

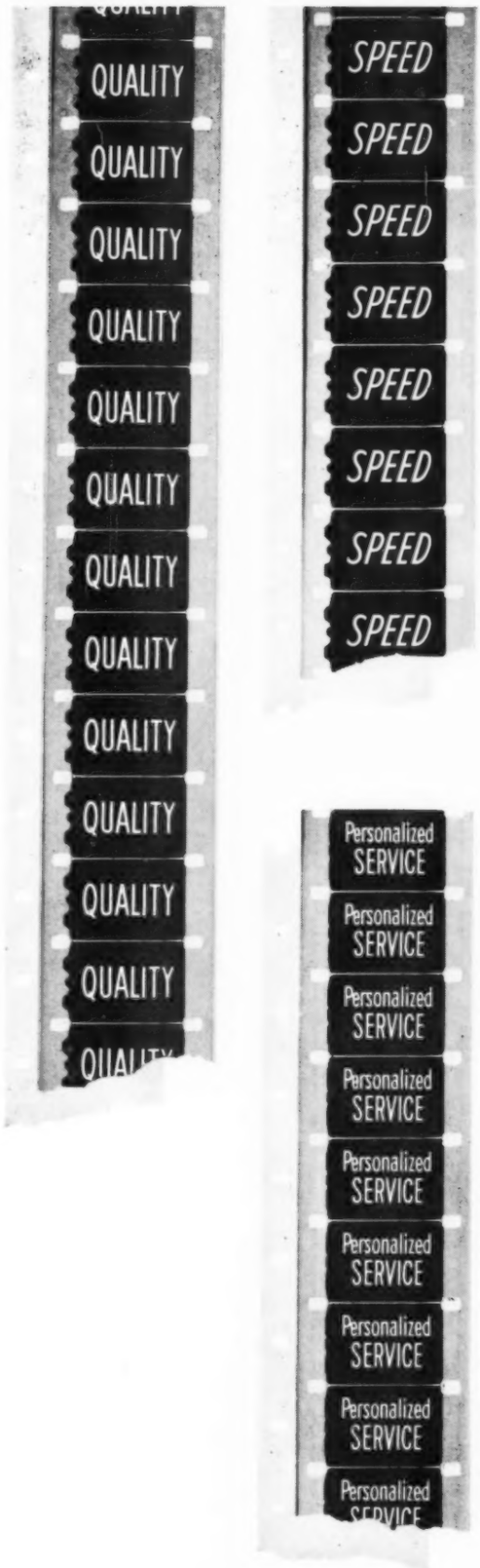
• • •

Charles Rosher, who retired from active cinematography several years ago to live in Jamaica, revisited Hollywood last month in company with Mrs. Rosher. During his active career in Hollywood, he won one of the two initial "Oscars" given by the Academy of Motion Picture Arts and Sciences for photographic achievement, and was subsequently honored by the George Eastman House with two awards for outstanding photography of early-day motion pictures.

He is a Cornerstone Member and Fellow of the Photographic Society of

Continued on Page 654

EXPLAINING to Arthur Miller (left) and S. C. Chuck operation of the Kenyon gyro stabilizer for hand-held cameras is author-cameraman Joseph V. Mascelli. Chuck, a Formosan cameraman and ASC member, is a Hollywood visitor.



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Continued from Page 652

America, and attended the PSA's recent annual convention in Louisville, Kentucky. He took part in the Society's program and was subsequently honored with a citation commemorating the fiftieth anniversary of his entering motion picture work, and was presented with a key of the city of Louisville by the mayor.

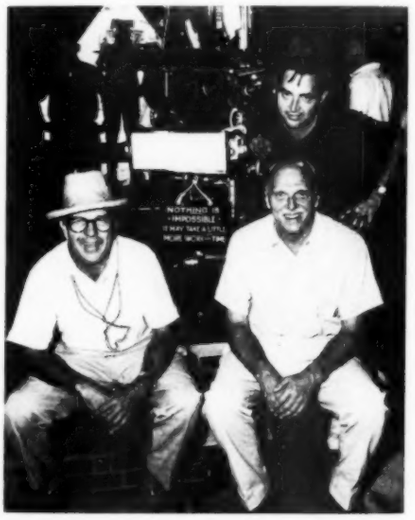
• • •

John Boyle, ASC, veteran cinematographer who had been in retirement due to ill health, passed away on September 29th. He had been an officer of the A.S.C. and was active in its management affairs.

Boyle's career as a cinematographer began in 1913 in his home town of New Orleans, Louisiana, where he owned and operated a newsreel known as the Item Animated weekly in connection with the New Orleans Item, a daily newspaper.

Moving to Hollywood in 1915, Boyle became a Fox cameraman and it was his filming of the chariot races for "Queen of Sheba," starring Betty Blythe, which led to his assignment to film MGM's first production of "Ben Hur."

Boyle had traveled widely and had filmed motion pictures in many foreign countries. During the Korean War he covered the South Pacific extensively with his camera. He was compelled to abandon the task of editing the resultant footage by the illness which eventually caused his death. ■



EXEMPLIFYING credo of cinematographer Ellsworth Fredricks, ASC, left, is motto hung on his camera during shooting of Warner Bros'. "Tall Story," directed by Josh Logan, right of Fredricks. Standing is assistant director, Hank Moonjean.

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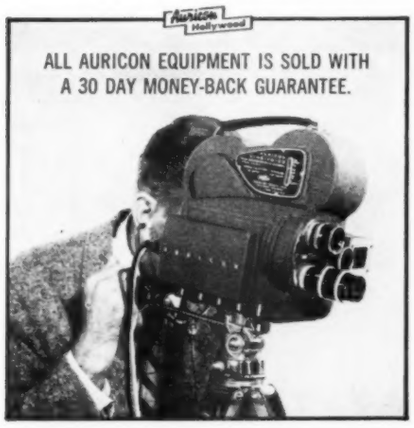
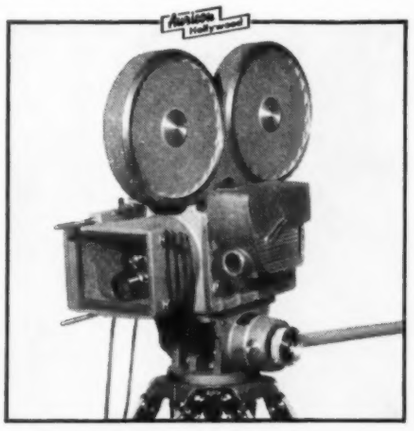


"CINE-VOICE II" 16 mm Optical Sound-On-Film Camera. ★ 100 ft. film capacity for 2¾ minutes of recording; 6-Volt DC Convertor or 115-Volt AC operation. ★ $795.00 (and up).



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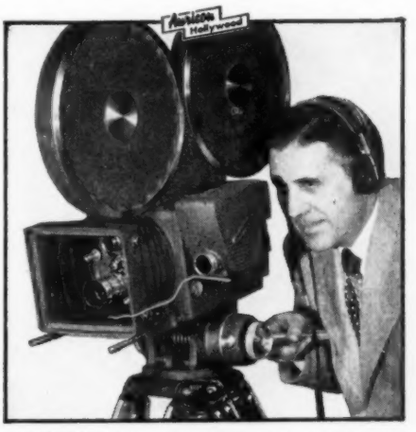

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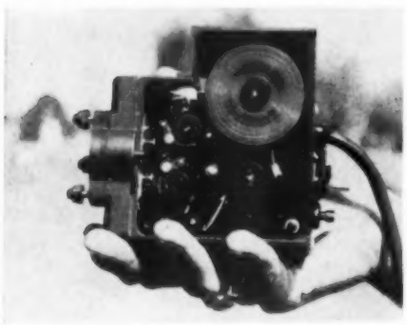
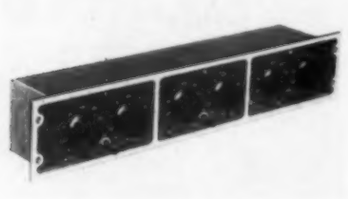


Tiny Recording Camera

A miniaturized 16mm motion picture camera weighing less than 3 lbs. and measuring 5 5/16" x 2 15/16" x 4 7/16" is the Traid-15, developed by Traid Corp., Encino, Calif. Equipped with variable shutter, magazine heater, 28-V DC motor, and adapted for interchangeable pre-loaded 50-foot magazines and GSAP or "C" mount lenses, the camera can be obtained with any single speed of 16, 64 or 100 fps. Designed particularly for photo recording in missiles and aircraft, the camera has double tooth sprockets for high "G" loading.

Planotype

Attractive plastic letters for composing titles for movies, slides, TV commercials, etc., are offered by Camera Equipment Co., New York, N.Y. Tradenamed Planotype, letters are extremely durable; may be used again and again, and are available in variety of type faces. Letters come affixed to 12"x15" aluminum sheet, and range in size from 5/8" to 1½" in height.

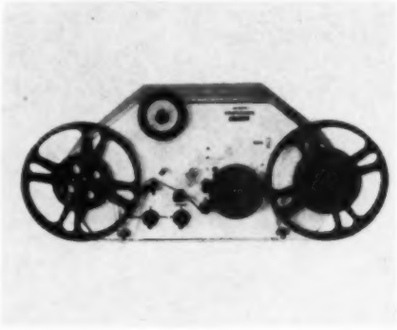


Triple Program Equalizer

Designed specifically for magnetic recording and reproduction is new Model G-803 triple program equalizer announced by Magnasync Mfg. Co., Ltd., 5546 Satsuma Ave., North Hollywood, Calif. Maintenance problems have been eliminated by sealing and encapsulating all components except switches. Features include low frequency controls of 8 positions in 2 db steps; high, in 8 positions of 3 db steps. Size is 19" x 3½" x 3½". List price is $395.00. Specification sheet available.

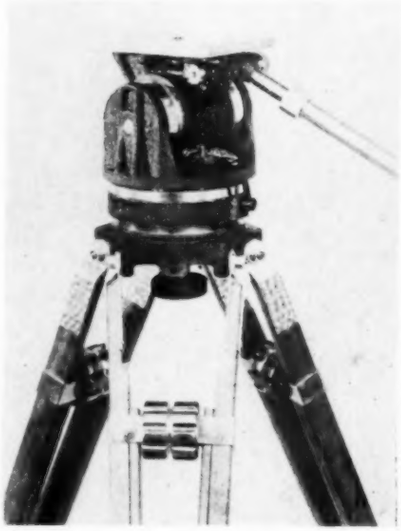
Car-Top Clamps

The Camera Mart, Inc., 1845 Bdwy., New York 23, N. Y., announces its improved Camart Car-top Clamps for mounting tripod on car or station wagon top. Of durable, weather-resistant bronze construction, clamps hold tripod rigidly and will not sway or bend. Price for set of three is $28.00.



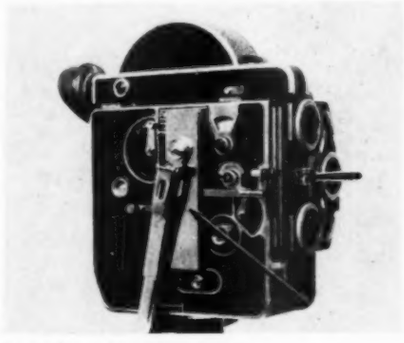
Sound Stripe Laminator

SOS Cinema Supply Corp., 602 West 52nd St., New York 19, N. Y., announces the "Sosound" Cinemaphon which laminates an oxide-coated 100-mil. or 50-mil. half-track sound stripe and an 8-mil. balance stripe on 16mm motion picture film for magnetic recording. Machine has a top speed of 1320-ft. per hour. List price is under $2,000.



Fluid-head Tripod

National Cine Equip. Inc., 209 W. 48th St., New York 36, N. Y., announces its "Hydrofluid" ball-leveling pan-and-tilt head tripod for use with most professional 16mm cameras and the Arriflex-35. Features include all-aluminum construction, ball-bearing mounted pan and tilt shafts, seasoned maplewood legs, self-aligning leg-locks, telescopic pan handle with provision for right or left hand use, and positive camera lock. List price is $329.50, including base.



Dissolve Attachment

Pellegrini-Piek, 1545 Lombard St., San Francisco 23, Calif., announces availability of the Yolo automatic dissolve attachment for the Rex model Bolex 16mm camera. The device produces standard 48-frame dissolves. The company also installs variable shutter units and automatic dissolve attachments in Bolex "H" model cameras.

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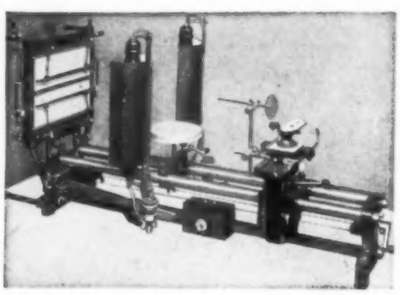

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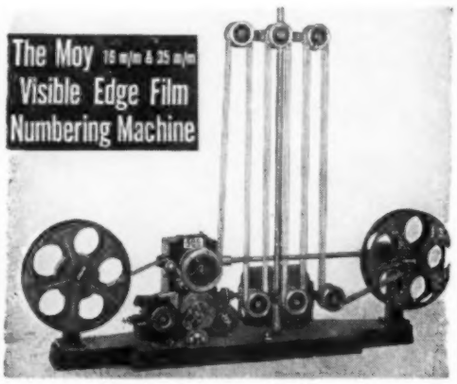

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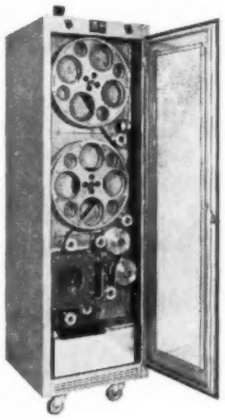

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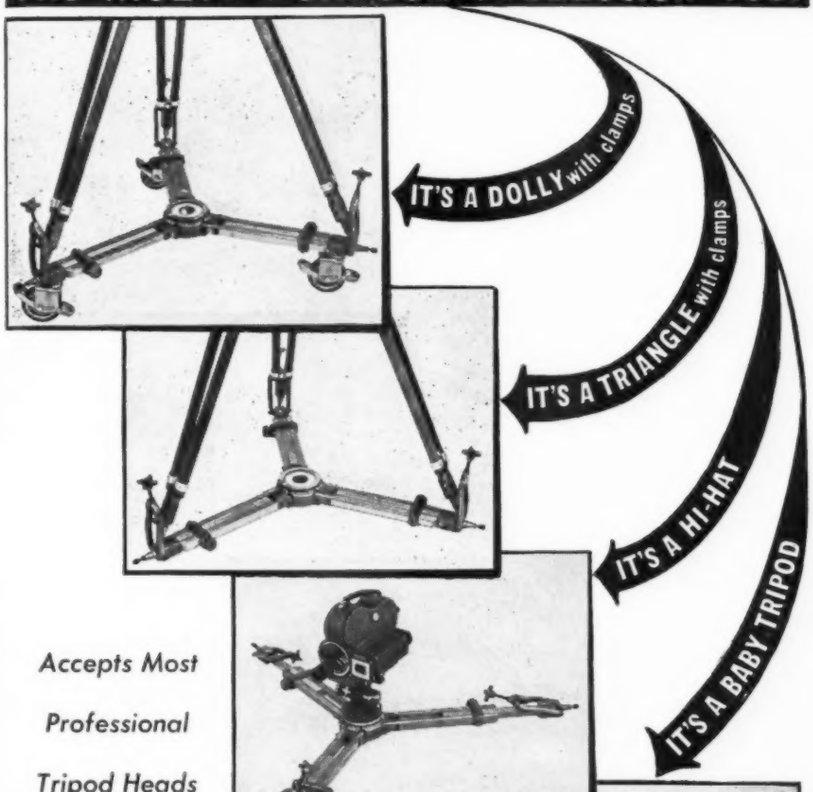

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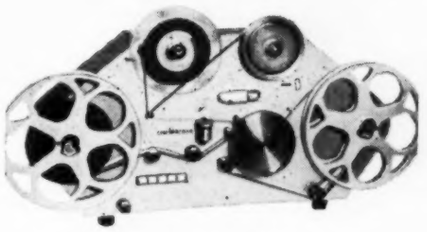

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A NEW, HIGH-SPEED color motion picture film that enables commercial producers to obtain color footage under previously impossible lighting conditions has been announced by Eastman Kodak Company. A reversal film, it is available in both daylight and tungsten type emulsions, 16mm and 35mm.

Eastman Color Reversal Film, Daylight Type, SO-260, has a normal exposure rating of 160—comparable to the fastest black-and-white cine films now made. A companion, tungsten-balanced film, Eastman Color Reversal Film, Type B, SO-270, has a normal index of 125.

The new film combines exceptional speed with adequate sharpness, moderate grain pattern and excellent color reproduction, according to Eastman Kodak Company. These characteristics permit motion picture photography in color under a wide variety of natural and artificial lighting conditions which previously have proved unsuitable.

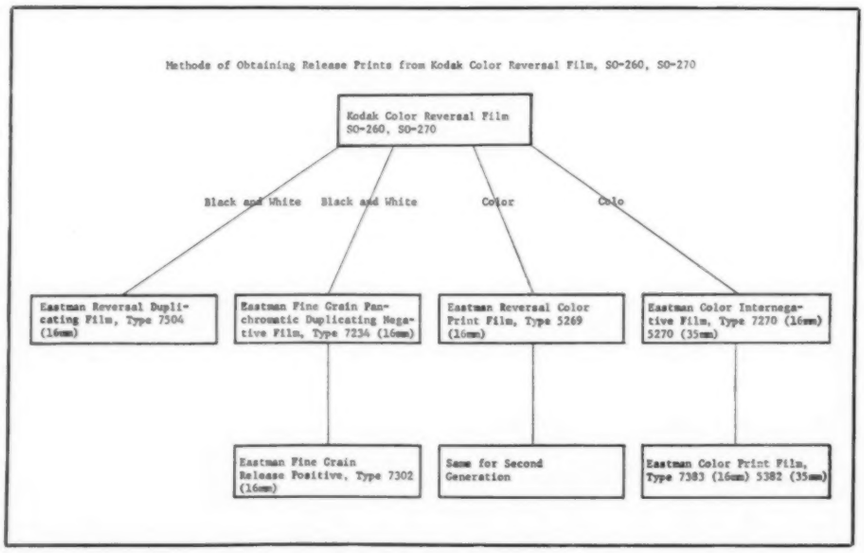
As an example of what the higher speed of the new tungsten-balanced SO-270 film means in terms of exposure under low light levels: at a shutter speed of 1/50 second at 24 frames per second sound speed with a lens aperture of f/1.4, the new film may be exposed at the normal 125 rating with only 18 foot-candles of incident illumination.

Commercial motion picture producers are expected to find the film particularly valuable when photographing fast-moving objects or interior scenes, such as broad orientation shots, which formerly posed lighting problems. It is expected that such footage on Eastman Color Reversal Film will be inter-cut with scenes exposed on slower, finer-grain films with optimum quality, such as Ektachrome Commercial Film, Type 7255.

In addition to the films' value in research and testing programs conducted in the nation's missile and aircraft industries, the new films are expected to be useful in a broad range of scientific, industrial and engineering photorecording applications, sports analysis, television color newsreel coverage, and medical research.

The new films will be available in limited supply beginning October 12 and in full supply early next year. Processing service will be offered by Kodak in Rochester, New York, and Hollywood, California, beginning October 5. Processing service may also be provided by other than Kodak laboratories or the film may be processed by the individual user if desired. Duplicate color prints can be made on any conventional print film.

Continued on Page 700


Methods of Obtaining Release Prints from Kodak Color Reversal Film, SO-260, SO-270
Kodak Color Reversal Film SO-260, SO-270
Black and White
Black and White
Color
Color
Eastman Reversal Duplicating Film, Type 7304 (16mm)
Eastman Fine Grain Panchromatic Duplicating Negative Film, Type 7234 (16mm)
Eastman Reversal Color Print Film, Type 5269 (16mm)
Eastman Color Internegative Film, Type 7270 (16mm) 5270 (35mm)
Eastman Fine Grain Release Positive, Type 7302 (16mm)
Same for Second Generation
Eastman Color Print Film, Type 7383 (16mm) 5382 (35mm)

HOW VARIOUS types release prints may be obtained from the new Eastman Kodak Co. reversal color film is shown in the flow diagram above.

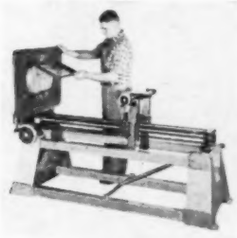
The first low-priced
TRIPLE-DUTY
animation, titlestand and product stage for all filmakers

F&B Triplex

Basic Stand **$895**
Complete as shown **$1595**

NOW—FOUR BIG NEW FEATURES

	WAS	NOW
over-all height, vertical post	76"	97"
over-all length	62"	102"
zoom range to tabletop	1-12 field	1-18 field
zoom range to floor	1-24 field	1-30 field



2—IN HORIZONTAL POSITION
For zoom titles, copy and product and puppet stages—

3—IN DIAGONAL POSITION
Columns can be locked at any angle between horiz. and vert. —for angular zooms in on table which is locked in horiz. position.

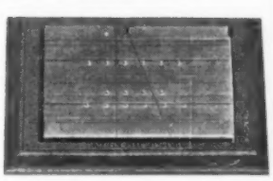
The TRIPLEX stand complete with camera, is now available for monthly rental. Write for complete information.

Serving the World's Finest Film Makers

F & B Butt Splice & Film Repair Blocks

These excellent blocks make butt splicing and repairing damaged film strips simple as A-B-C. Easy to use, no complicated parts, and solidly constructed they are available in the following models:

Model B-16 for 16mm. film **$ 9.50**
Model B-35 for 35mm. film 12.50
Model BSB - Combination block for 16mm., 35mm. and ¼" tape **24.50**



Magic "Mylar"

This amazing sprocketed splicing tape will repair torn and damaged films, replace torn perforations and allow you to butt-splice without losing a single frame. Comes in transparent for film, opaque for magnetic film. Splice will never come apart and perforations stay permanently repaired with Magic "Mylar."

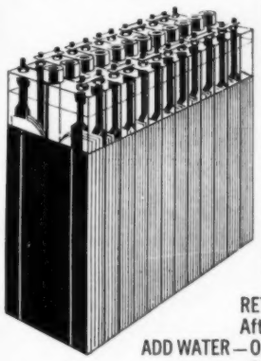
Transparent—For Film	per roll
16mm.—Single Perf.	$ 6.00
16mm.—Double Perf.	8.00
35mm.	11.00
Opaque—For Magnetic Film	**per roll**
16mm.	$ 6.00
35mm.	11.00

NEW IMPROVED F & B CAMERA SLATE

Here at last is the new F & B Camera Slate designed to professional specifications. Look at some of the exclusive features: Permanently attached ring-mounted numbers • Spring-loaded hardwood clapstick • Sturdy masonite construction • Erasible hard slate finish • Large 12" x 16" size

Reg. $29.50 NOW...$14.95

NEW F & B POWER-MITE NICKEL CADMIUM BATTERIES



LARGEST CAPACITY—6-10 amp. hours
SMALL-LIGHT—6 oz. per 1.25 v.cell
INDESTRUCTIBLE—Can be stored indefinitely in any condition
SAFE—No Acid Spray or corrosion
CHARGES EASILY—To 90% in 20 minutes, and 100% in 30 minutes
RETAINS 70% CHARGE—After 1 year's storage
ADD WATER—Only a few drops ONCE A YEAR

PERMANENT ELECTROLYTE—30% solution of Potassium Hydroxide
Batteries are supplied in a metal case with a leather carrying strap and plug.

7½ Volt—Power-Mite battery (6 cells) . . . . . $ 85.00
15 Volt—Power-Mite battery (12 cells) $135.00
Attached voltmeter—optional . . . . . $ 20.00

F & B's Power-Mite batteries can be supplied in any combination to power practically all cameras, recorders, etc. All the features listed are absolutely guaranteed by F & B. The Power-Mite nickel cadmium battery is unconditionally guaranteed for one full year.

SPECIAL BATTERIES CUSTOM-BUILT TO YOUR ORDER

MILLER FLUID DRIVE HEAD

Model D (medium duty) $150.00
Swivel leveling joint 59.50
Pro Head (heavy duty) 299.50
Fits all Tripods. Write for complete information and literature NOW.

F & B proudly announces the exclusive distribution of the Miller Fluid Heads in the Eastern United States. The Miller Head is the world's finest precision built hydraulic drive pan head, and is designed for super-smooth panning and tilting. Can be used with any movie camera.

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PHOTOGRAPHIC ASSIGNMENTS

WHAT THE INDUSTRY'S CAMERAMEN WERE SHOOTING LAST MONTH

By MARION HUTCHINS

IN GOOD COMPANY—Right in the middle is the labeled chair of cinematographer William Daniels (Note the ASC!) in a corner of a 20th Century-Fox sound stage where Daniels is presently photographing "Can Can."

ALLIED ARTISTS

ARCHIE DALZELL, "The Hypnotic Eye" with Jacques Bergerac and Allison Hayes. George Blair, director.

ELLIS CARTER, ASC, "The Purple Gang" with Barry Sullivan. Frank McDonald, director.

AMCO STUDIOS

ALAN STENSVOLD, ASC, "Police Station"* "Congressional Investigator"* (Sandy Howard Prods.) Sandy Howard, director.

EDWARD CRONJAGER, ASC, "The Threat" (Robin Rae Prod.) with Robert Knapp and Linda Lawson. Chas R. Rondeau, producer-director.

AMERICAN NATIONAL

CURT FETTERS, MONROE ASKINS, "The Man and the Challenge"* (Ziv-TV) with George Nader.

BOB HOFFMAN, Bat Masterson"* (Ziv-TV) with Gene Barry; "Tombstone Territory"* (Ziv-TV) with Pat Conway.

WILLIAM WHTLEY, ASC, "Men into Space"* (Ziv-TV) with Bill Lundigan.

JACK MARQUETTE, BOB HOFFMAN, RICHARD RAWLINGS, "This Man Dawson"* (Ziv-TV) with Keith Andes.

MONROE ASKINS, Commercials*.

CALIFORNIA STUDIOS

STUART THOMPSON, ASC, "Have Gun, Will Travel"* with Richard Boone and Kam Tong.

FLEET SOUTHCOTT, "Gunsmoke"* with James Arness and Dennis Weaver.

FRED BENTLEY, "The Lineup"* with Warner Anderson and Tom Tully.

CASCADE PICTURES

ELWOOD BREDELL, ASC, Commercials*

COLUMBIA

CHARLES LANG, JR., ASC, "The Franz Liszt Story" (C'Scope & Color; Goetz Picts.) with Dick Bogarde and Capucine. George Cukor, director.

CHARLES WELBORN, "Manhunt"* (Screen Gems) with Victor Jory and Patrick McVey. Fred Jackman, director.

IRVING LIPPMAN, "Tightrope"* (Screen Gems) with Michael Connors.

GERT ANDERSEN, ASC, "Donna Reed Show"* (Screen Gems) with Donna Reed. Oscar Rudolph, director.

FRED GATELY, ASC, "Father Knows Best"* (Screen Gems) with Robert Young and Jane Wyatt. Peter Tewksbury, director.

HENRY FREULICH, ASC, "Dennis the Menace"* (Screen Gems) with Gloria Henry & Herbert Anderson.

PHILIP TANNURA, ASC, "Man from Blackhawk"* (Screen Gems) with Robert Rockwell.

WILKIE COOPER, "I Aim at the Stars" (Morningside Prods.; shooting in Germany) with Curt Jurgens and Gia Scala. Lee Thompson, director.

DANIEL FAPP, ASC, "All the Young Men" (Hall Barlett Prods.) with Alan Ladd and Sidney Poitier. Hall Bartlett, director.

CHARLES LAWTON, ASC, PHILIP TANNURA, ASC, "Alcoa-Goodyear Theatre"* (Screen Gems).

THOMAS TUTWILER, ASC, RALPH STAUB, ASC, "World Championship Golf Show"* (Screen Gems). Fred Briskin, director.

DESILU STUDIOS—Culver City

LUCIEN ANDRIOT, ASC, "U. S. Marshall"* (Desilu Prods.) with John Bromfield.

CHARLES BURKE, "Man with a Camera"* (Desilu Prods.) with Charles Bronson.

CHARLES VAN ENGER, ASC, "Betty Hutton Show"* (Desilu Prods.) with Betty Hutton. Richard Kinon, director.

HAL MOHR, ASC, points out new camera angle to producer-director Andrew Stone during filming of "The Last Voyage" in Japan for MGM.

JOSEPH RUTTENBERG, ASC, (left) talks over upcoming scene for MGM's "Wreck of the Mary Deare" with star Gary Cooper and Director Michael Anderson.

HENRY CRONJAGER, "Grand Jury"* (Desilu Prods.) with Lyle Bettger and Harold Stone. Sobey Martin, director.

EDWARD FITZGERALD, ASC, "The Gale Storm Show"* (ITC Prods.) with Gale Storm and ZaSu Pitts. James Kern, director.

DESILU STUDIOS—Gower

KENNETH PEACH, ASC, "Lassie"* (Jack Wrather Prods.) with June Lockhart and John Provost.

ROBERT PLANCK, ASC, "The Millionaire"*. James Sheldon, director.

ROBERT HAUSER, "Wyatt Earp"* (Desilu Prods.) with Hugh O'Brien.

PAUL IVANO, "The Texan"* (Desilu Prods.) with Rory Calhoun.

CHARLES STRAUMER, "The Untouchables"* (Desilu Prods.) with Robert Stack and Jerry Paris.

ROBERT PITTACK, ASC, "Ann Sothern Show*" (Desilu Prods.) with Ann Sothern.

DESILU STUDIOS—Hollywood

ROBERT DE GRASSE, ASC, "Danny Thomas Show"* (Desilu Prods.) with Danny Thomas, Sheldon Leonard, director. "Love and Marriage"* (Desilu Prods.) George Abbott, director.

LOTHROP WORTH, ASC, "The Real McCoy's"* (Brennan-Westgate Prods.) with Walter Brennan. Hy Averback, director.

SID HICKOX, ASC, "Jack Benny Show"* (Desilu Prods.) with Jack Benny. Seymour Berns, director; "Milton Berle Show"* (Desilu Prods.) with Milton Berle; "Lucille Ball and Desi Arnaz Show"* (Desilu Prods.) with Lucille Ball and Desi Arnaz. Jerry Thorpe, director.

NICK MUSURACA, ASC, "Westinghouse-Desilu Playhouse"* (Desilu Prods.).

FOX WESTERN AVENUE

JAMES VAN TREES, ASC, "The Many Loves of Dobie Gillis"* with Dwayne Hickman. Rod Amateau, director.

GENERAL SERVICE

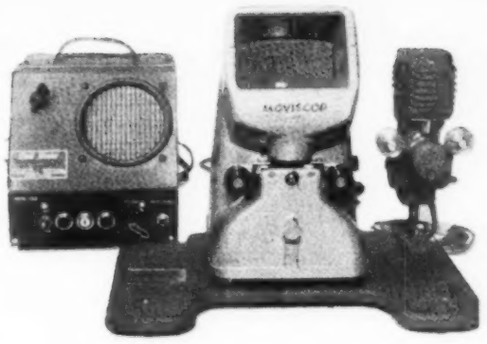
HAROLD LIPSTEIN, ASC, "Adventures of Ozzie & Harriet"* (Stage 5 Prods.) with Ozzie, Harriet, David and Rickey Nelson. Ozzie Nelson, director.

FRANK REDMAN, ASC, "Perry Mason"* (CBS-TV) with Raymond Burr and Barbara Hale.

Continued on Page 701

OUR EXPERIENCE IS YOUR KEY TO

SERVICE & DEPENDABILITY



CAMART DUAL SOUND EDITOR MODEL SB 111

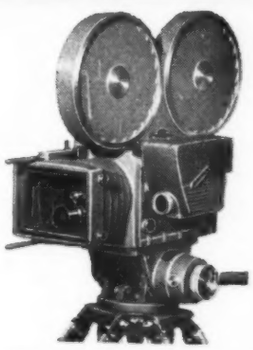
Complete with opticacolor magnetic reproduction head, base plate, amplifier and speaker. For single or double system. An unbeatable combination with the Zeiss Moviscop 16mm precision viewer, sharp brilliant 2¼ x 3¼ picture.

16mm Dual Editor (without Viewer) $195.00
Zeiss Moviscop Viewer 89.50
Special Zeiss Editor-Viewer Combination 269.50
35mm Dual Editor w/ACE 35mm Viewer 329.50

CAMART SLATE & CLAPSTICK

Large professional size for sound productions. Contains space for all essential information. This is the same slate that originally sold for $11.75.

Now only $4.75



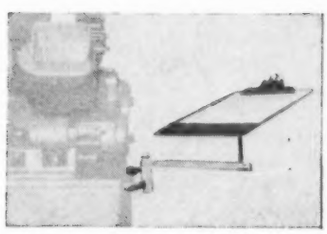
AURICON PRO-600 & SUPER 1200

Single system 16mm sound on film Cameras.. Latest model Cine-Voice 16 sound cameras. TV Kinescope shutters, new and used in stock. Accept trades.

CAMART CAR-TOP CLAMPS

Insure a steady tripod support for your camera when atop a station wagon or car platform. Heavy bronze construction. Weatherproof.

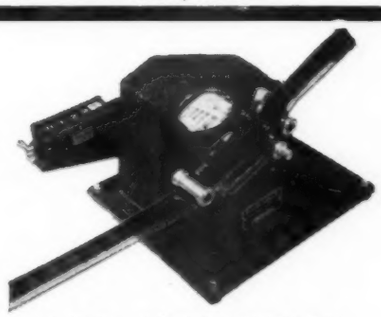
Set of three
$28.00



CAMART MOVIOLA WRITING DESK

- As necessary as your right arm.
- Easy to attach—no drilling or tricky installations.
- Holds script or other notes.

$19.95



A.C.E. 35MM ROTARY VIEWER

Permits viewing of film between rewinds forward or backward at rewind speed. Designed to facilitate viewing original negative film without scratching. Ideal for editors, lab workers, animators and TV technicians $169.50
Footage and Frame Counter Optional 74.50

CAMART TV MIKE BOOM

Improved model with new internal noisless mechanism for directional mike control. Over 8 feet high and 13 feet in length. Folds for studio or location.

$297.50

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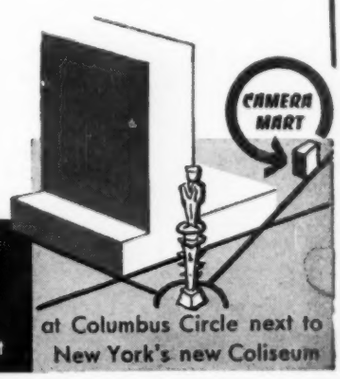

the CAMERA MART inc.

1845 BROADWAY (at 60th St.) NEW YORK 23 • PLaza 7-6977 • Cable: Cameramart

at Columbus Circle next to New York's new Coliseum

ALL YOUR NEEDS

FROM CAMERA TO SCREEN...
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16mm GUN CAMERA

Magazine load. 24 volt drive. 16, 32, 64 fps. Ideal for instrumentation and other special uses. Complete w/1-3/8" f3.5 lens.

NOW ONLY **$54.50**

16mm AMPCO ARC SOUND PROJECTOR

30 amp. hi-intensity arc, auto. carbon feed, rectifier, amplifier and 12" speaker. Top quality 2" proj. lens. Heavy duty stand and cables included.

Hollycam Special **795.00**

LIST WAS $1795.00.

NEW NEUMADE 16mm REWINDS

2000' capacity. Heavy duty model w/tension adjust. $15.00 list.

1 geared & 1 dummy end—List $15.00..... 9.50

2 geared ends—List $20.00..... 14.50

CUNNINGHAM 35mm CAMERA WITH BALTAR LENSES

Only hand held 35mm camera with dual pilot pin registration. 4-lens turret. Weatherproof magnesium body with pistol grips and rifle stock. 3-speed electric motor. 16, 24 and 32 fps. 170° rotary shutter. Eye level finder with fields for 3 lenses.

ORIGINAL COST WAS OVER $7,625.00!

COMPLETE OUTFIT

- Camera w/35mm f2.3 Baltar, 75mm f2.3 Baltar and 6" f4.5 tele.
- 3-speed electric motor
- Integral viewfinder
- 200' magazine w/ Mitchell type pilot pin registration movement
- Carrying case for camera, spare lenses, magazine, film and accessories.

LIMITED QUANTITY **595.00**

16mm FILM

50' Kodak Mag. Super-X Rev. w/process.	2.75	400' Super-XX Negative	4.25
50' Mag. Linagraph Pan	3 for 3.95	400' Kodak Tri-X Negative	4.50
50' Kodak Super-XX Negative	3 for 1.95	400' Tri-X Neg. Single perf.	4.95
100' Outdoor Anscochrome	5.45	400' DuPont Superior III Neg.	4.25
100' Microfilm, Unperf.	1.85	400' Background-X Neg. Single perf.	4.95
100' Kodak Super-X w/processing	2.95	400' Super-XX Neg. Single perf.	4.95
100' Kodak Super-XX Rev. w/process.	2.95	400' Ansco Color Neg. Tungsten	9.50
100' Kodak Tri-X Reversal	2.49	1200' Background-X Neg. Single perf.	12.95
100' Kodak Linagraph Ortho	.95	1200' Tri-X Neg. Single perf.	12.95
100' Ansco Hypan Reversal	1.95	Ends, Type 5269 Color print stock 1000'	21.00
100' Background-X Negative	1.50		
400' Kodachrome Daylight	19.95		

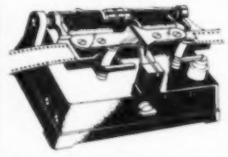
Write for your copy of our new catalog, showing hundreds of items for still, cine, and aerial photography. Large section on processing equipment.

BELL & HOWELL 35mm Eyemo "Q"

Complete outfit. 8 to 48 fps. Outfit includes camera w/spider turret & open back, 1", 2" and 6" B & H lenses w/filters and sunshades, new Eyemo motor, power cable, two 400' mags., drive belt and drum finder. LIST VALUE OVER $2000!

ALL THIS FOR **595.00**

GRISWOLD 35mm FILM SPLICER



A Neumade product. For fast accurate splicing on frame line with accurate hole spacing. No adjustments required.

Model R-2, List $32.00 USED **13.95**

Model T, w/light and cement bottle. List $45.00 NEW **24.50**

PRO JR. TRIPOD

Mfg. by Camera Equip. Co. Height adjusts from 52" to 71". Large camera plate, for even largest 16mm cameras. Smooth pan and tilt. List $150.00.

ONLY **89.50**

New ones Available at $99.50

Case $9.95

NEW BELL & HOWELL CORDOMATIC REELS

Brand new. Automatically rewinds 50' of speaker cable. Heavy duty metal housing w/spring-loaded core. Adaptable to many other uses. LIST $33.50.

SPECIAL **14.95** Including Cable

CINE SPECIAL CAMERA

SPECIAL OFFER! Fabulous 16mm Kodak Cine Special with 200 ft. film chamber, 110 volt synchronous motor, masks, carry case and 2 Kodak lenses. LIST VALUE OVER $1500.00!

Our price **695.00**

35mm FILM

100' Ansco Color Tungsten Neg.	8.95	200' Kodak Linagraph	2.45
100' Eastman Color Negative	8.95	400' Ansco Color Tungsten Neg.	29.50
100' Kodak Microfile	3.95	400' Kodak Super-XX	7.95
100' Kodak Tri-X	2.75	400' DuPont Superior II	5.95
100' Kodak Photoflure	3.25	400' DuPont Superior IV	14.95
100' Kodak Super-XX	1.90	400' Kodak Linagraph	5.95
100' Dupont Superior III	1.80	400' Kodak Tri-X	9.95
100' DuPont Superior IV	3.95	1000' Kodak Super-XX	18.50
100' Kodak Linagraph	1.50	1000' DuPont Superior III ASA 50	13.50
200' Kodak Super-XX	3.80	1000' Kodak Tri-X	19.50
200' DuPont Superior III	2.45		

Some materials are from former U.S. Gov't stocks. Equipment not listed as new or reconditioned is used. All prices f.o.b. our warehouse.

HOLLYWOOD CAMERA CO.

All equipment is guaranteed to be as advertised. Check with order please, or 25% deposit, balance on delivery. Purchase orders welcomed from D&B rated firms. Minimum order $5.00.

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EQUIPMENT . . .
LOWEST PRICES . . .
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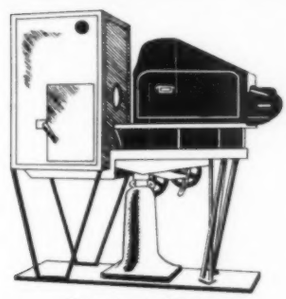


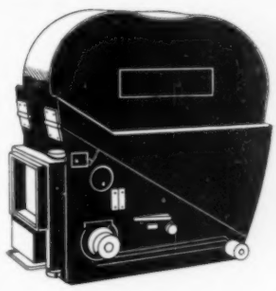
List value is $18,000.00.

TEAGUE 35mm MOTION PICTURE
BACKGROUND PROJECTOR

Complete 35mm background process projector on heavy-duty adjustable pedestal with tie-downs, rotary distributor, Bell & Howell dual pilot pin registration movement, motor and magazines. Projector is completely blimped. Optical system includes lens, condensers, and shutter. Projector and camera can be interlocked or run "wild." 180 amp Peerless High Intensity Rotary Arc.

COMPLETE, READY TO OPERATE **$3850.00**

RABY STUDIO BLIMP



For Mitchell "NC" or Standard cameras with sound motor. Spring-actuated, counter-balanced top allows easy access to camera for magazine changing or film threading. Follow-focus operates from **outside** blimp. Built-in magnifier and pilot light.

List price is $1500!

SPECIAL **$685.00**

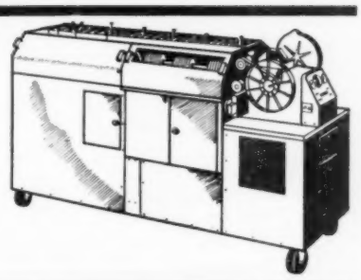
DORMITZER CINE-LIGHT 250B

Powered by long-life Nickel-Cadmium batteries. Small size and light weight. 250 watt light output. adjustable 9" reflector for spot or flood type beam patterns. Designed for all-weather shooting in both color and black and white. Weighs only 14 lbs. Color temperature 3400 degrees Kelvin.

NEW

COMPLETE WITH BATTERY CHARGER, ONLY **$350.00**

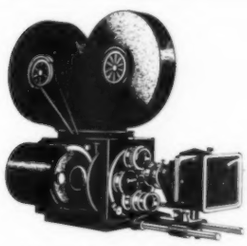
HOUSTON 16/35 PROCESSOR



Model A-11 for 16 and 35mm, black and white negative, positive, reversal processing.

Original list: $7250.00

Our price **$2450.00**



HOLLYCAM PRICED AT **$5300.00**

MITCHELL STANDARD

Mitchell Standard Camera with built-in features including 4-way mattes, rack-over, dissolving shutter, 4-lens turret, frame and footage counter, etc.

COMPLETE OUTFIT INCULDES:

Mitchell 35mm Standard Camera.
Set of f2.3 lenses: 24mm, 40mm, 50mm, 75mm, 100mm and 125mm focal lengths.
Matte box and sunshade.
Viewfinder.
Reducing finder adaptor.
4 - 1000 ft. magazines.
Motor.
Complete set of cases.

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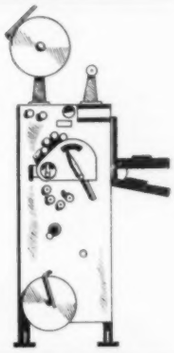

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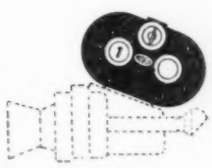

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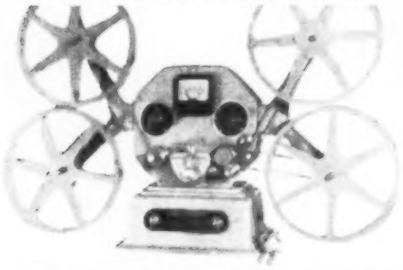

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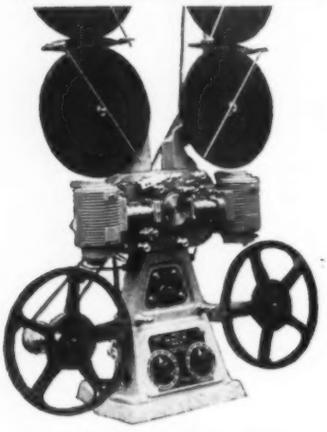

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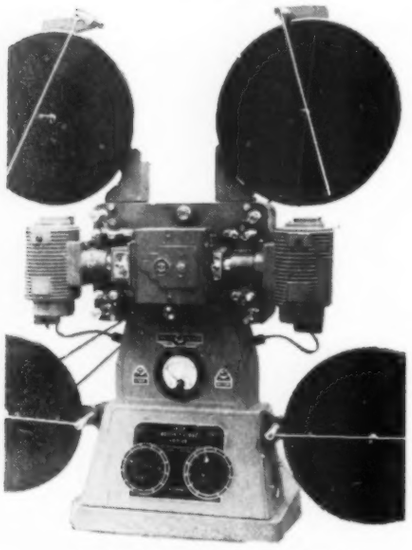

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WALTER STRENGE'S

QUESTIONS & ANSWERS

Need advice on a picture making problem? Your questions are invited and will be answered by mail. Questions and answers considered of general interest will appear in this column each month.

Q Do professional motion picture film makers and film laboratories use perforated ¼-inch magnetic tape for sound recording If so, where can I purchase such tape?—*P.G.W.*

Answer: Perforated ¼-inch recording tape is not used by the major studios of Hollywood or other professional film makers in the Hollywood area. However, it is used by the National Film Board of Canada. Source of this tape is Minnesota Mining and Mfg. Company, St. Paul 6, Minn.—*Loren L. Ryder, A.S.C. Associate.*

Q Using a Weston Master III exposure meter, is there a quick rule-of-thumb I can use in the field for converting the f/-stop readings to T-stop equivalents for the Kinoptik lenses I use? Would you recommend purchasing a T-stop-calibrated meter (if such is available) and use it instead of the Weston?

I shoot a great deal of footage from distances of 1,000 feet and more, and while thus far I have been able to determine exposures for shots pretty accurately (by taking readings on nearby objects: grass, tree trunks, the ground, etc.) this is at best guess work. If there is a meter that will measure subject light from distances of 1,000 feet or more, I want one—provided, of course, it contains T-stop settings or a quick method of converting from f/-stops.—*A.L.H.*

Answer: There is no fixed ratio between T-stops and f/-stops which would apply to all lenses. The difference between T-stop and f/stop is something that is determined by the design and construction of each particular type lens. The difference between T and f/stops represents light losses within the elements of a given lens. Consequently, this is not a factor which can be incorporated into an exposure meter, since the exposure meter must function in connection with many different lenses.

Many cinematographers have excellent success determining exposures for distant outdoor subjects by using an incident light exposure meter. This meter is used at a location where the illumination is the same as that at subject's location. Outdoors, the illumination is usually uniform over a considerable area, so that frequently the incident light meter can be used right at the camera location.

In connection with outdoor photography of distant objects, it is usually important to also use a haze filter on the camera lens to eliminate the adverse effect of haze, which may be invisibe to the eye but which tends to produce an effect of over-exposure.—*Don Norwood, A.S.C. Associate.*

Q In order to provide fill light for a large area outdoors, I understand that several sunlight reflectors are often used together. I have observed that most cinematographers achieve very evenly lighted scenes with reflectors, even to the extent of controlling the sun-to-fill ratio (3:1). It would seem impossible from a time standpoint alone to individually place the various reflectors and measure the light. How is this uniformity achieved and the correct ratio maintained without unduly delaying production?—*V.S.*

Answer: The placement of sunlight reflectors is always controlled by the position of the sun in conjunction with the angle of the shot that is being made. Large areas are "filled" by using a number of reflectors—sometimes a dozen are used. But with enough grips on hand to constantly change the position of the reflectors, the desired result is accomplished.

Cinematographers never measure the light from reflectors to determine a light value ratio. This is accomplished through experience and judgment — judging the balance by sight. Also, a great many shots are "filled" with booster lights, instead of with reflected light, especially closeups and medium shots.—*Arthur Miller, A.S.C.*

Q I am planning to make a picture with Ektachrome commercial film, using a Cine Special camera with Ektar lenses and also an Arriflex 16 with Schneider lenses. Test footage shot with both cameras show scenes made with the Schneider lenses are considerably

Continued on Page 668

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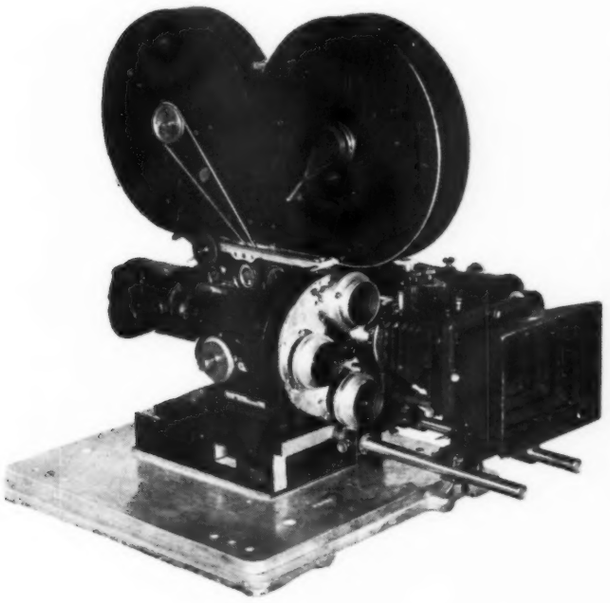

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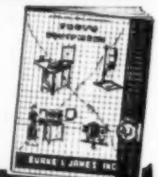

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QUESTIONS AND ANSWERS

Continued from Page 666

"bluer" than those made with the Ektars. Can such differences be corrected in the printing?—*E.P.*

Answer: It is suggested that the lenses be corrected so their respective results will match. If this is not possible, use of compensating filters on the lenses is suggested.

Keep in mind that some film laboratories offer scene-to-scene correction in Kodachrome printing.—*Ted Fogelman, A.S.C. Associate.*

Q When negative film is used in the production of single-system optical sound films for television, and the image changed electronically to positive in the course of TV transmission, fast films such as Tri-X or DuPont 928 are utilized, and a variable density galvanometer used in the camera. What effect does the grain pattern of these fast films have on the sound reproduction? And what would happen to the sound track if it became necessary to overdevelop the film to gain a suitably dense picture negative?—*J.A.S.*

Answer: Apparently it is your intention to play the single-system negative on the TV film reproducer. The track must then be considered as a "direct positive" recording and, to avoid serious distortion, must be exposed very low with a resulting unbiased density of approximately 0.4. The noise reduction operation must be reversed—that is, greatest exposure while there is low sound level.

To answer your specific questions: 1) The grain pattern from negative type stock is very detrimental to sound, resulting in a pronounced "hiss" during low-level sound passages. 2) Overdeveloping the single-system recording raises the gamma (contrast) on picture and sound together. However, in the case of "direct-positive" recording, the higher gamma is beneficial rather than detrimental. This is true for both variable area and variable density types of recording.—*Loren Ryder, A.S.C. Associate.*

Q When using ordinary 150-watt lamps with Colortran equipment and setting the Colortran to 3400° K, must I use a filter with daylight-type Kodachrome film? If I use Type A Kodachrome, should I set the Colortran to 3200° K?—*A.L.L.*

Answer: It is necessary to use a Kodak Wratten 80B filter over the camera lens when exposing daylight Kodachrome to 3400° K illuminant. This film-filter combination is suggested for emergency use only, since it is inefficient in use of available exposure illumination. It is recommended that Type A Kodachrome be exposed with 3400° K illumination without a filter. For 3200° K illumination, a Kodak light-balancing filter No. 82A is required for this film.—*Vaughn C. Shaner, A.S.C. Associate.*

Q To complete a film on a major construction project, I plan to utilize some color slides for scenes where no motion picture footage is available. I plan to photograph the slides by means of back-projection, using a fine-grain translucent screen about 2 ft. by 3 ft. in size. 1) is this size screen large enough? And may I pan or zoom? 2) The slides are Kodachrome. I will rephotograph them with either Kodachrome A or Ektachrome Commercial. How do I figure exposure. 3) What about color temperature?—*W.G.T.*

Answer: 1) Any size screen may be photographed, depending on the amount of light put out by your background projector. It is best not to pan on this screen, but you may zoom in directly on your center line. 2) Again the exposure will depend on the amount of light put out by your projector. A yellow flame carbon is recommended. Your exposure will also be governed by the screen size. The larger the screen, the greater amount of light will be required by the BG projector to balance with the amount of light on the foreground object. 3) The color temperature of your projector lamp should be 3200° K.—*Paul Eagler, A.S.C.*

Q I have a Filmline processing machine designed to handle reversal and negative/positive developing, and which is equipped with a tank having capacity of 4.5 gallons of solution. When should I replenish the bath and what are the keeping properties of the bleach bath in reversal? Can you also suggest a reference book dealing with laboratory practice for neg/pos film and chemicals?—*P.R.*

Answer: Suggest you write to Eastman Kodak Company, DuPont or Ansco and request their books on chemical analysis. These will answer all the immediate problems with which you seem to be faced. The companies named also have books available on laboratory practices and procedures.—*Lou Vincent., A.S.C. Associate.*

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MORE THAN TWO MILLION Russians witnessed "Glimpses of the U.S.A." presented at the recent Moscow Fair in a montage of images projected simultaneously on seven 20 by 30 feet screens. Most of the pictures shown were still photographs re-photographed on 35mm motion picture film and presented with music and narration in Russian. Image synchronization was insured by interlocking the projectors.

SEVEN SCREENS FOR MOSCOW

How America's unique multiple-screen film presentation for the Moscow Fair was conceived, produced and staged.

By HERB A. LIGHTMAN

AT THE AMERICAN EXHIBIT at the recent Moscow Fair, a unique multiple-screen motion picture presentation was the center of attraction. Unlike anything conceived heretofore, the presentation and the network of equipment by which it was screened is the culmination of the efforts of Charles Eames, internationally famous industrial designer, and his wife, Ray.

I was recently a guest at the Eames' studio in Venice, California where I was treated to a private showing of their multiple-screen production, "Glimpses of the U.S.A.," which graphically revealed the American Way of Life to the Russian people with such impact that even Mr. Khrushchev, who eagerly attended the Moscow exhibit, was visibly impressed.

The seven separate picture sequences, which were projected at the Moscow Fair on huge screens 20 by 30 feet in size, were projected by Eames in his studio in a miniaturized version of the Moscow setup in which the screens are scaled down to one-fifth original size. Whereas the Moscow presentation was done with motion picture projectors and 35mm color film, Eames' studio presentation utilized film strip projectors operated in conjunction with an English version of the sound track.

It is difficult to describe the 12-minute presentation of sight and sound which I witnessed. Scenes are con-

stantly changing on the seven screens suspended from overhead. The ear is arrested by the dramatic musical score composed especially for the presentation by Elmer Bernstein. A lucid, honest narration gets right to the core of things. But still—you have to see and hear it to believe it.

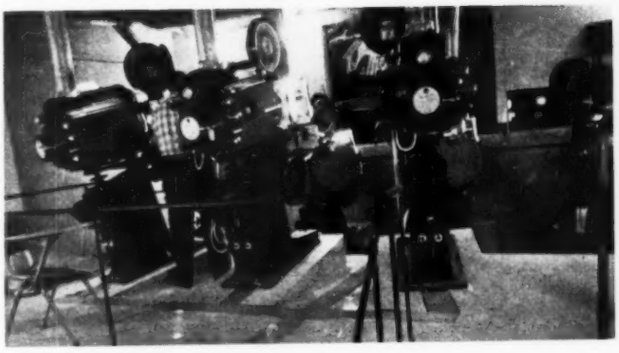
As the lights are dimmed and the music begins, the seven screens come alive and show various constellations of stars in the heavens. This is followed by night aerial shots of a great city, which dissolve to a number of day shots of landscapes, both rural and urban. The great city is seen—silent in the early morning hours, then slowly stirring as people leave their homes and crowd a myriad of freeways en route to school, work or other pursuits.

VIEW OF Russian audience watching U.S. film presentation on the seven overhead screens.

Show America At Work

Typical Americans are shown at their daily occupations; and there are striking scenes of research, industry, farming, and shopping centers. Equally impressive are the scenes depicting typical Americans in after-sundown activities—at the dinner table, watching television, relaxing, etc., others attending church, theatres, and night clubs.

An ensuing sequence depicts a typical Sunday in America—people going to church, puttering around the house or garden, going on a picnic, and engaging in active and spectator sports. Next there is depicted a quiet moment late at night as people take leave of one another; tender nighttime farewells of both old people and young lovers; scenes of mothers tucking their children in bed; and, finally, on a single screen — a tenderly nostalgic shot of a bunch of forget-me-nots gradually fading out, accompanied by the haunting strains of a flute solo.



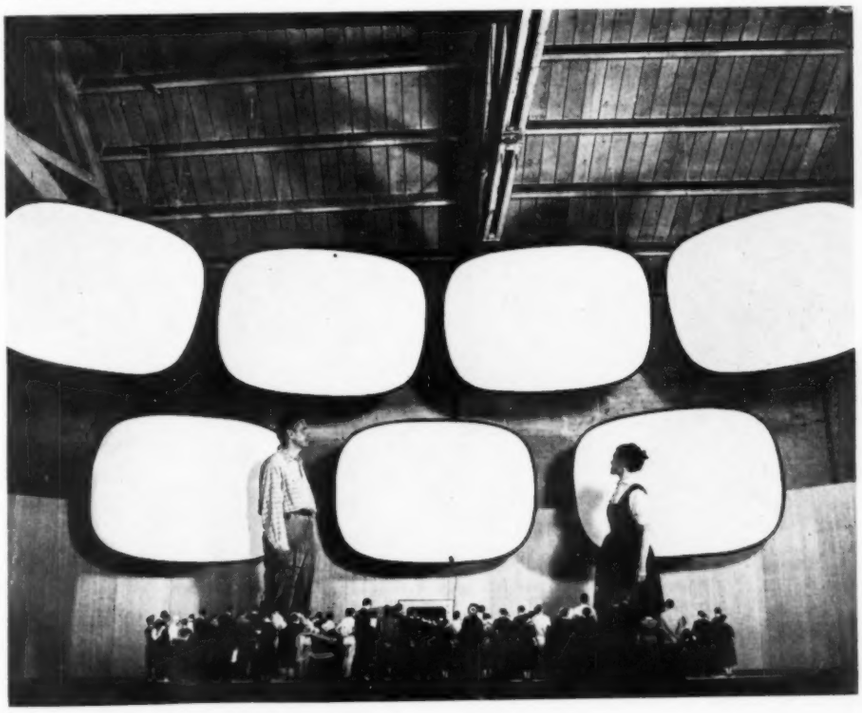
INSIDE projection booth, showing five of the seven 35mm projectors used.

If this is propoganda, then it is magnificent propoganda — excitingly presented, simply and thruthfully stated, hitting the audience with a tremendous impact.

This formidable project began a year ago last December when the State Department made arrangements with the Russian government to have an exchange of exhibitions. The United States Information Service was assigned to "produce" the show for the Moscow Fair. George Nelson, an industrial designer, planned the physical aspects of the Fair. A meeting was next arranged with Charles Eames to decide the problem of what one nation, like

Continued on Page 696

CHARLES EAMES, who produced and staged film presentation at Moscow Fair, stands with his wife, Ray,, on stage of his Venice, Calif., studio before a miniaturized version of the Moscow screen setup. Group of people in foreground is cutout of photographic enlargement arranged below screens to effect orientation for purposes of demonstrating the multiple screen system.



COLOR IN MOTION PICTURES AND TV

Part III: Natural Color For Television

New problems arise when color productions are filmed in the usual way for exhibition on TV. Television gives good color reproduction only at high light levels; color films exhibit their purest color at low light levels.

By ROBERT ALLEN MITCHELL

COLOR TELEVISION is an additive system throughout. No primary-subtracting color dyes are involved. The picture is produced by splitting the image of the original scene into its three primary-color components, (Fig. 1), broadcasting the corresponding signals in a special form so that the image can be reproduced in monochrome on black-and-white receivers, and finally, in the color receiver, recombining the red, green, and blue signals into a full-color image. This is accomplished by means of the three-gun kinescope, the face of which is silk-screen printed with a mosaic of very tiny red, green, and blue phosphor dots.

The electronic niceties of color TV are very complex and require extremely close control in operation. The "compatible" NTSC (National Television Standards Code) system employed in the United States and Canada is further complicated by an electronic matrixing process which extracts from the red, green, and blue color signals a *luminance signal* which can be reproduced in monochrome by ordinary TV sets.

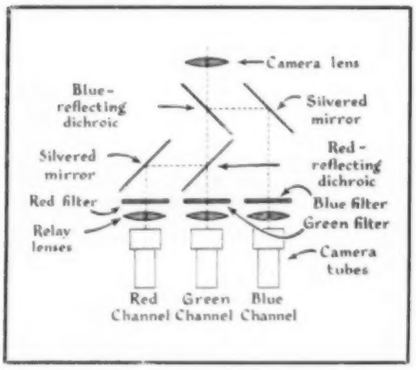


FIG. 1—Color analysis by the optical system of a color TV camera. Image entering camera lens (at top) is split into its three primary-color components by a complex of mirrors, filters and relay lenses and directed to the red, green and blue channels of the color video system.

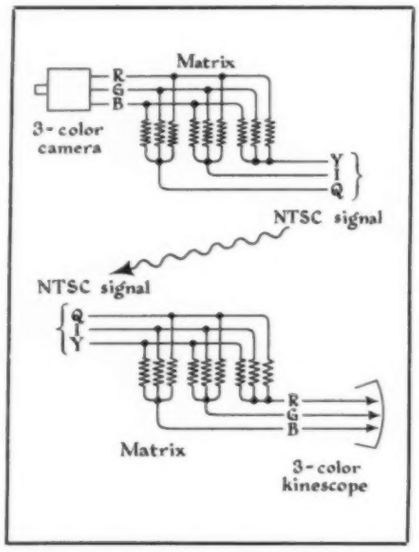


FIG. 2—The NTSC (National Television Standards Code) "compatible" color broadcasting method employed in the U.S. and Canada.

Because the luminance signal is theoretically identical with the "supersaturated-green," or Y, response of the human eye, which is itself identical with the spectral luminance curve (the curve labeled Y in Fig. 1 of Part I), this signal is denoted by the letter Y in technical literature.

After matrixing, therefore, the composite $R + G + B$ signal is converted into partials denoted by $Y + I + Q$, Y being suited for image reproduction on monochrome receivers, and $I + Q$ consisting of residuals of the red and blue color signals, and together called the *chrominance signals*. (Fig. 2).

The color receiving set reverses this process by a matrixing circuit which converts the $Y + I + Q$ signals picked up by the antenna into the original primary $R + G + B$ signals to operate the electron guns which form the colored picture additively by exciting the red, green, and blue phosphors of the picture tube by varying degrees.

From the color standpoint, the range of colors possible with the NTSC television system is satisfactory except in the bluish-green and cyan regions of the color scale and along the "purple line" which includes violet, purple, magenta, and red. We know that the most practicable additive process should employ primaries of 100 per cent saturation located very close to 700 millimicrons for the red primary (a deep, intense red), 525 for the green primary (a vivid bright green, which is only just perceptibly yellowish), and 460 for the blue primary (a deep, vivid ultramarine-blue). The NTSC primaries do not quite conform to these specifications because of the

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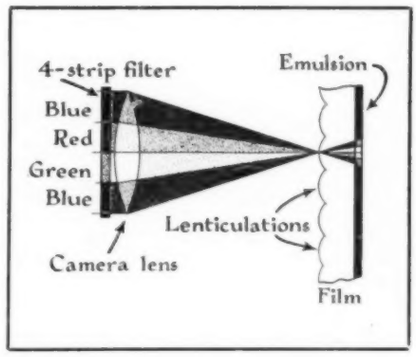
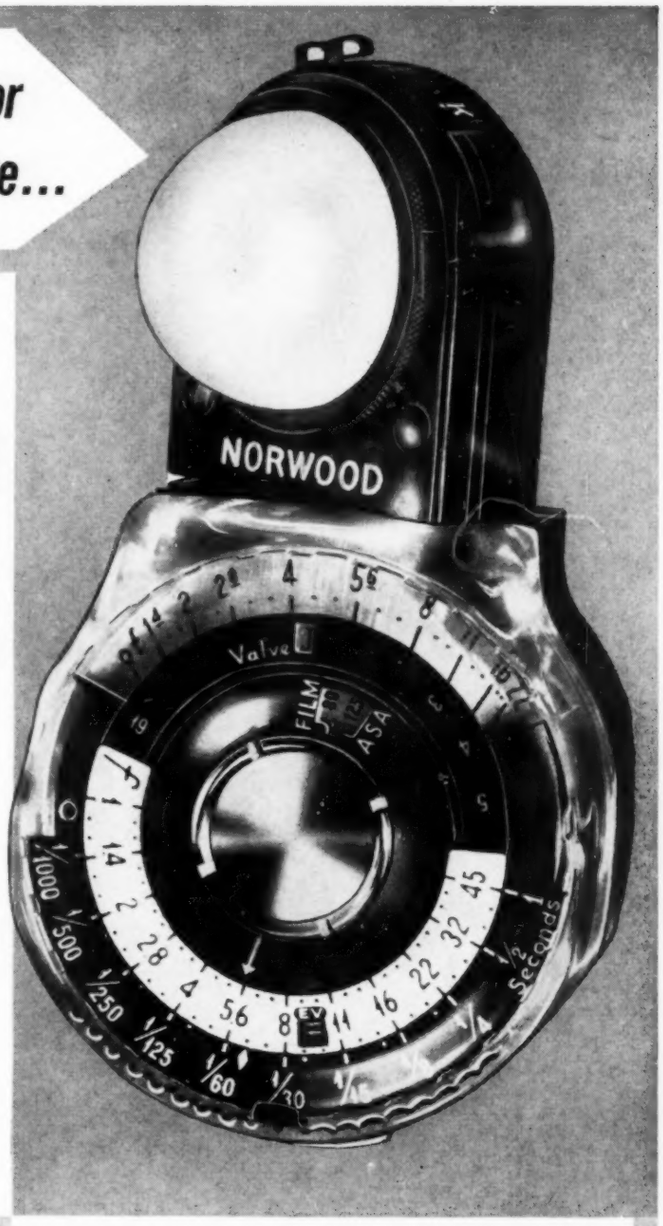


FIG. 3—The optical principle of lenticular additive-color film. The image is monochrome, and does not appear in color until projected through a 4-strip color filter similar to that used in photography.

The whole secret of good color photography is right here...



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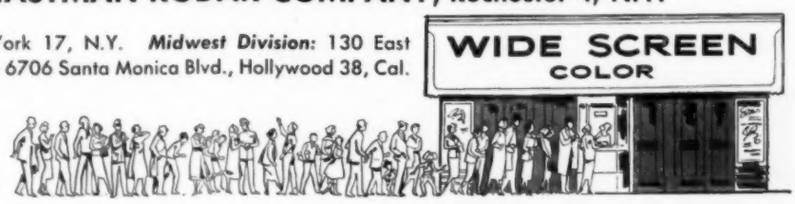

about it... that counts

TRAVELING MATTES IN COLOR

The sodium lamp method employed in British studios utilizes panchromatic film for the matte negative.

By ROBERT L. HOULT, FRPS, FBKS

Formerly Technical Adviser, Pinewood Studios, England.

THE TECHNIQUE OF using Sodium light in the production of color traveling mattes was first disclosed in 1947 by Jean Kudar (Ref. 1); improvements in technique were disclosed in 1951 by Hoult et al. (Ref. 2). Both these patents are now owned by the Rank Laboratories, Denham, England.

It fell to the lot of the author, during the period 1952-1956, to introduce this process in an economic form into general use in England, in succession to the black-and-white process described in a previous paper (Ref. 3).

To operate the color and black-and-white processes on a commercial basis, a special department has now been set up at Denham laboratories in London to handle all the business of shooting and processing composite scenes. This provides a regular service for film producers in British studios, where scarcely a major film is now made which does not owe some of its appeal or some of its economy to the discreet use in production of traveling matte technique. This traveling matte department has been organized on the model of the Technicolor Camera Department, as an adjunct to the laboratory where processing is eventually to be carried out.

Black-and-White and Color Processes Compared

The paper (Ref. 3) describing the black-and-white process was reprinted in "American Cinematographer" for October, 1959. The color process is basically the same as the black-and-white process, differing mainly in the color of the light used for photography and its method of beam-division in the camera, while subsequent processing differs only insofar as color film is used instead of black-and-white film.

Having first understood the principles on which the black-and-white process is based, it becomes easy to follow the differences necessitated by the use of color film. First among these is the need to illuminate the foreground subject with "white" light instead of "yellow" light to preserve foreground color balance. Although it is sufficient to expose black-and-white picture negative to the sum of green and red wavelengths only (the constituents of "yellow" or minus-blue light), color film demands the presence of blue, green and red wavelengths in suitable proportions. With what wavelengths, then, can we illuminate the backing, which is to be complementary in color to the foreground?

Certain other color traveling matte processes go outside the visual spectrum for this purpose and use either ultra-violet or infra-red radiation. The present process makes use of monochromatic yellow light — that narrow spectral band which lies between the green and the red, and which is not required for three-color photography (Fig. 1). Its removal from the spectrum of white light has no noticeable effect on photographic color rendering, although a slight change in hue may be apparent to the eye.

To remove efficiently a narrow spectral band in this way is not easy, but fortunately the mineral didymia has this property, and a practical light filter can be made of glass containing didymium salts (Fig. 2). Studio lamps covered by didymium filters thus emit white light deficient in monochromatic yellow—i.e., a mixture of blue, green and red only.

To generate independently a monochromatic yellow light to illuminate the backing, use is made of commercial sodium tubes, whose emission spectrum is substantially a single line at 589 millimicrons wavelength (Fig. 3). With sodium lighting on the backing, and didymium-filtered white lighting on the foreground, we again have two complementary colors, which are the basis of

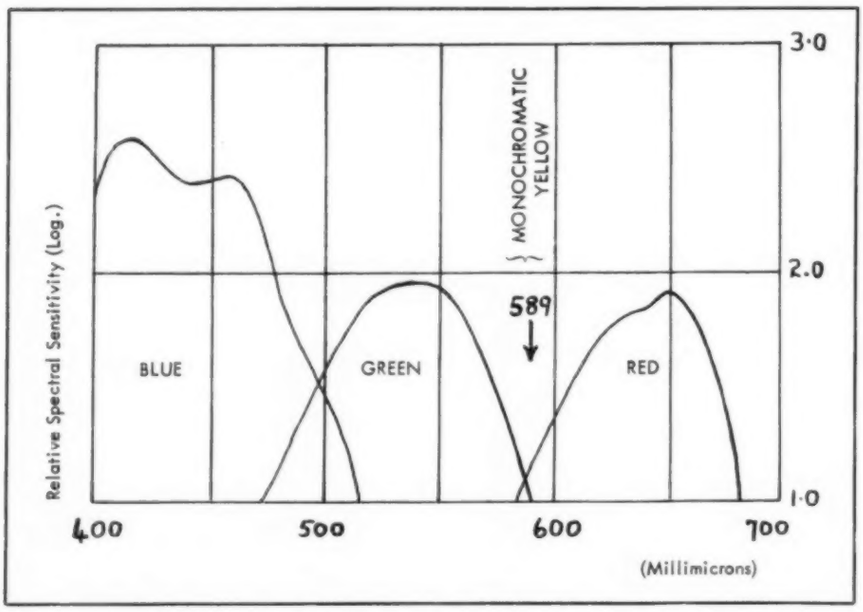

FIG. 1—Spectral sensitivity curves of Eastman Color negative Type 5248. (Courtesy Kodak, Ltd.).

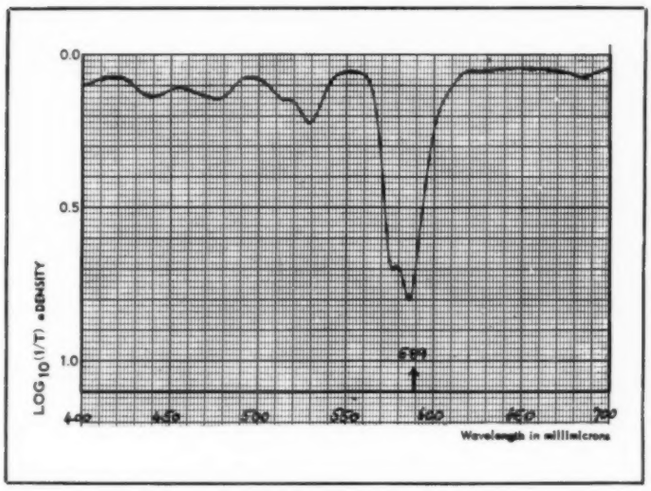

FIG. 2—Spectral density curve of Chance didymium glass filter.

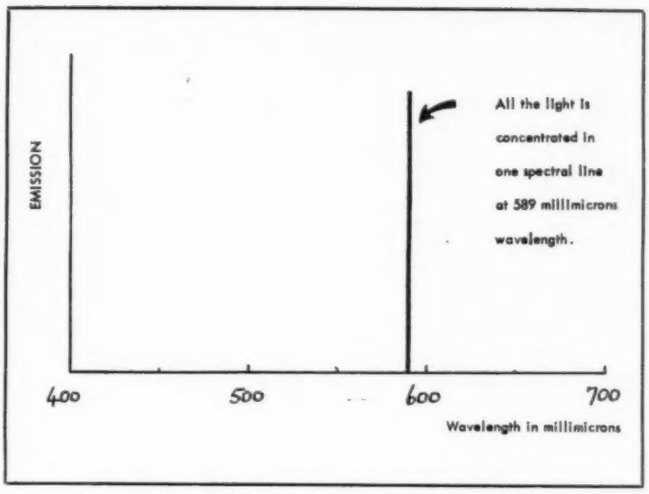

Fig. 3—Emission spectrum of sodium lamp tube.

the photographic technique described for the black-and-white process.

In this case, of course, a blue backing is not appropriate; the ideal color would be monochromatic yellow; but such a color is impracticable to achieve in paint or dye with reasonable efficiency, so a white backing is used instead. This requires careful "niggering" from foreground spill-light, but no more so than does a process projection screen. In practice, no real difficulty arises from this cause.

The Beam-splitting Camera

The same type of beam-splitting camera is used as has been described for black-and-white work—the only difference being in the optical equipment. Instead of dividing the beam into blue and minus-blue, the beam-divider has to transmit selectively to the matte negative film a narrow spectral band centered on the sodium line, and reflect the residue of blue, green and red light to the foreground negative film, which in general is Eastman Color type 5248 (Fig. 1).

Division of white light in this way is made possible by the use of a 45-degree controlled interference filter coating, suitably graded to compensate for the differing angles of incidence between rays passing through different parts of the field. There is insufficient space here to describe this type of filter in detail, but readers will find a full description in Ref. 2 noted at conclusion of this article.

The foreground (reflected) beam then passes through a didymium filter (within the camera), while the matte (transmitted) beam passes through a yellow filter—both to remove unwanted residual wavelengths—before reaching their respective negative films.

With this camera, 75mm, 50mm and 35mm taking lenses are provided for normal photography, while for Cinema-Scope-type results a 2X anamorph can also be used.

Foreground lights may be either arc or inky, although for economy the former are preferred—the reason being as follows:

The color negative film used is balanced to a color temperature of 3200 degrees K. This C.T. is modified by the spectral transmission characteristics of the beam-splitting camera and is further modified by the didymium glass filters (Fig. 2) which are fitted to the foreground lights. In consequence, the required C.T. of foreground lighting is raised to nearly 5400 degrees K, and is obtained exactly by using an H.I. arc covered by a Wratten CC-20-Y filter, such as is available in sheet form as Wratten LCT filter material. When inky lights are used, they require both a didymium glass filter and a C.T. blue filter—the latter to raise the color tem-

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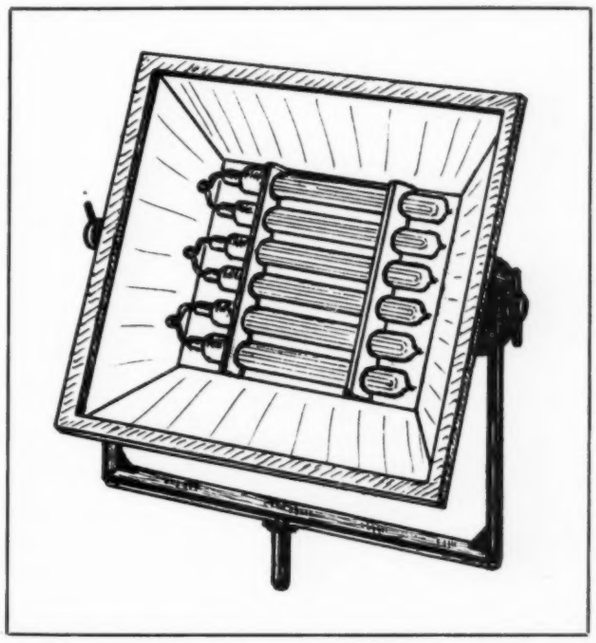

FIG. 4 — Six-tube sodium lamp such as used for lighting backings. Tubes are available in a maximum size of 140 watts and must be mounted in horizontal position, as shown.

FIG. 5—Examples of two closeups made by the traveling matte process described by author. Squeeze effect in image is due to anamorphic compression of the CinemaScope photography, which was used for both the background plates and the closeup subjects.

perture of the inkies from 3200 to approximately 5400 degrees K. In consequence of the filtering thus introduced into the foreground lighting, a residual effective C.T. of 3200 degrees K is exactly obtained in the film plane, which yields correct color balance in the foreground negative.

Lighting the White Backing

The foreground light is deficient in monochromatic yellow, but, as explained earlier, this is of no photographic consequence. A concentrated source of monochromatic radiation at 589 millimicrons is now provided by commercial sodium tubes and directed onto the white backing.

These sodium tubes are available in a maximum size of 140 watts, and since when hot they contain molten sodium metal, they must be mounted in a horizontal position. Units have been constructed (Fig. 4), each containing six sodium tubes stacked vertically in a square layout, and mounted in cradles which fit into the sockets of the stands and turtles provided for normal studio lights.

The deployment of these special sodium lamps around a backing is thus facilitated—a typical rig for a backing 24 feet wide being twelve units (containing 72 tubes). These units are generally mounted for convenience in two mobile towers—one at each side of the backing—each tower carrying six units in three levels, two per level. Such a lighting rig provides enough light on the backing to allow the camera to be operated at about f/4, and the intensity of the foreground lights is then adjusted accordingly.

The sodium tubes will operate from A.C., which at mains frequency (50 c/s in London) "beat" with the camera shutter frequency (24 f.p.s.) and produce undesirable frame-to-frame variations in matte negative density. The sodium tubes are therefore operated from 3-phase A.C., the three pairs of tubes in each lamp unit being fed from separate phases.

A black-and-white panchromatic film is used as matte negative and is developed to the highest possible gamma. Sufficient negative contrast is obtained to enable a first-generation matte positive (also developed to a high gamma) to be used to produce the composite negative, exactly as described for the black-and-white technique, although of course in conjunction with color duplicating stock.

Matte-wise, the composite negative has the same quality as is obtained in the black-and-white process. It reproduces faithfully smoke, haze, rain, reflections in glass, etc., without difficulty —the reason being that, as before, the processing at no time employs a negative matte.

The Composite Negative

Color-wise, the composite negative is a first-generation dupe, and is as good as the duplicating technique of the film stock and the laboratory processing between them will allow. In fact, a very high standard is now possible, and examples of this process incorporated in recent productions bear witness to its general acceptance by the most critical of producers. (See Fig. 5). It should be noted that all the scenes within the stagecoach appearing in this production were also produced by this process, as well as a few exterior closeups.

In the early days of traveling matte production, composite negatives were all made on standard optical printers. By 1956, the amount of business had increased sufficiently to warrant the construction of a double-head optical printer, which is now in almost continuous use for the production of black-and-white and color composite negatives.

This printer contains two projection heads and one camera head; the two images being collated by a beam-combining prism block of 50/50 neutral transmission/reflection ratio. The equipment thus acts as a beam-splitting camera in reverse, and enables composite negatives to be printed speedily and accurately—all adjustments for optical registration and light-balancing being monitored visually on a built-in focusing screen before starting the camera.

The Traveling Matte Department

This department, as stated earlier, is organized on the model of the Technicolor camera department. Under the department head are employed traveling matte technicians, a grade created specially for this purpose. Their headquarters comprise an office and a workroom situated at Denham Laboratories, where inquiries from interested film producers are received and arrangements made to service productions. From this office, too, control is exercised over T.M. technicians at work in various studios, as well as over the process-

Continued on Page 693

Mary Pickford in *Pollyanna*, 1920.

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NOAH'S THREE SONS, Shem, Japheth and Ham, listen to their father's plans for building Ark to save them from the coming deluge. Scene is from Walt Disney's "Noah's Ark," featuring new style animation.

BIRDS AND BEASTS board the Ark. Here may be seen some of the hundreds of odds-and-ends items which were used in creating the various characters in "Noah's Ark."

What are Walt Disney's newest animated characters made of? Buttons, nuts, and pieces of string, and a thousand-and-one other things. These form the characters in

"NOAH'S ARK"—WALT DISNEY'S FIRST NON—CARTOON ANIMATED FILM

By ARTHUR ROWAN

AFICIONADOS of the animated film will find something new, provocative and hilarious in Walt Disney's forthcoming featurette, "Noah's Ark," which marks his first departure from animation of inert drawings. Instead of pen and ink illustrations on cels, Disney's animators have fashioned a bevy of new and intriguing characters from odds and ends familiar to everyone—things like buttons, rubber erasers, pipe cleaners, bits of yarn, bottle corks, clothespins, nuts, etc. Noah and Mrs. Noah, and their three sons, Ham, Shem and Japheth, plus a myriad of animals and birds which join the cruise of the good ship Noah's Ark, come to life through skillful manipulation by Disney animators of their buttons-to-butternuts anatomical components.

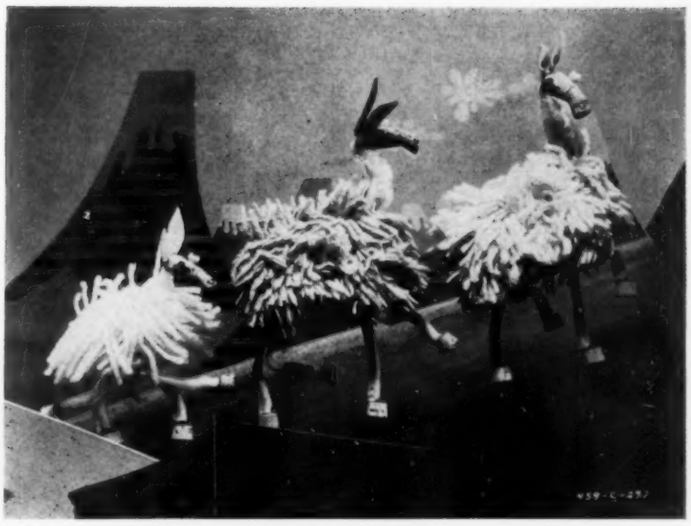
Always on the search for the new and the novel in motion picture entertainment, Walt Disney has produced an entirely different concept in animated films with this sparkling featurette in color. When he first considered "Noah's Ark," he felt the subject lent itself to a new approach to the animation technique. He called in one of his veteran animator-directors, Bill Justice, and turned the project over to him. Instead of the usual animated drawings, it was decided the characters themselves should undergo a major change. Justice first thought of designing figures composed of coins of different sizes. As he pondered the project, toying the meanwhile with such odds and ends on his desktop as paper clips, erasers, pencils, etc., inspiration came to him. "Why not three-dimensional characters made of things such as these!"

Several prototype characters were put together and presented to Disney for approval. He immediately liked them and gave Justice the "go-ahead" to proceed with the production.

The accompanying photos, which are scene reproductions from "Noah's Ark," show some of the hundreds of miscellaneous odds and ends that went into the construction of the characters. Ping pong balls were used for heads, with bits of chenile, fur or yarn serving as hirsute adornment. Small ceramic-tipped pins were used for eyes on some of the characters, and squares of colorful fabrics were fashioned into costumes with nothing more than a pair of scissors.

The second photo, showing two cranes, a goat and a rhino mounting the gangplank to the Ark, reveals the simple components used generally in fashioning the characters:

NOAH INVITES MOOSE to join "cruise." From such simple things as a bottle, paintbrush tip, picnic forks, pipe cleaners and corks, an amusing moose was created by Disney animator-stylists.



AFTER DELUGE, llamas debark and head for the Andes. Colored yarn, chenile ornaments, pipe cleaners, corks and bits of felt made up these prancing characters.

typewriter erasers, pieces of chenile ornamentation, a couple of soft-drink sippers, and split pencils were the chief parts used to form the two cranes that board the Ark. A bottle cork became the body of the goat to which was added four pieces of wire for legs, the tip of a small paint brush for a tail, a section of pipe cleaner served as a neck, and a pecan—adorned with paint brush tip for a beard, and sections of sippers for horns—became the head. The rhino's body was fashioned from sections of cork tile, and every golfer will recognize the plastic golf tees used for the horns! The tick bird on the rhino's back was made of two beads plus bits of wire, yarn and felt. The other photos reveal similar artistry and imagination.

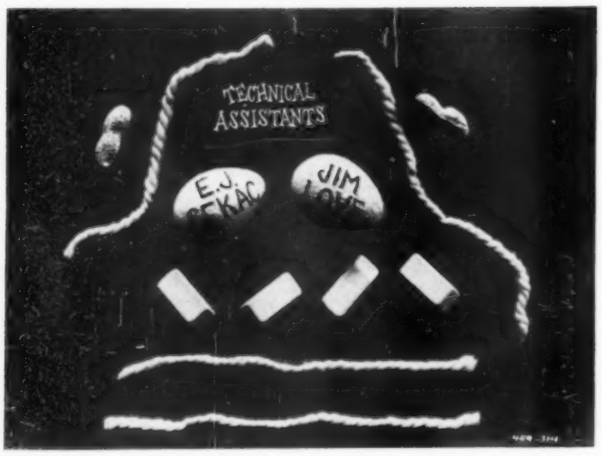
The pattern of what is to come is exemplified in the opening titles of the picture, with the words of the initial title card forming magically from pink yarn unraveling from a nearby skein. Elsewhere on another page are photos which show the articles that went into formation of the credit card for Technical Assistants: two peanuts, two Easter eggs, four erasers and four strips of yarn. Through the magic of stop-motion photography, these items become two flamingos, which carry the names of technicians E. K. Sekac and Jim Love.

To compose other title cards and also the various characters for "Noah's Ark." Hollywoood dime stores were searched for items having possibilities as figure components.

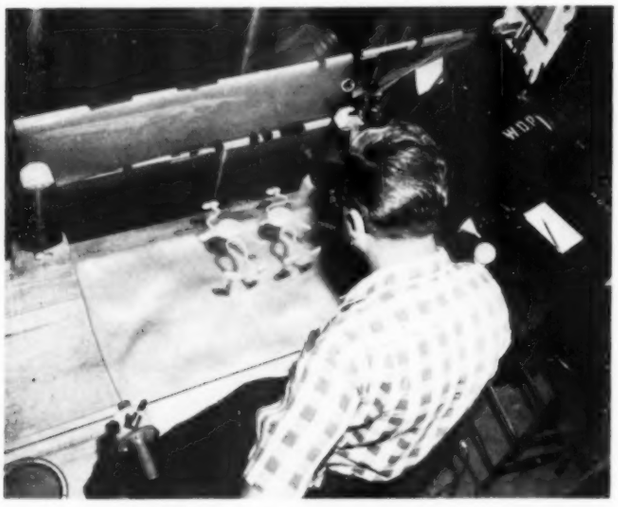
According to Disney animator Xavier Atencio, who is credited along with T. Hee and director Bill Justice with the styling and character movement of the production, over a thousand different articles were collected for possible use in the construction of the more than 150 characters which

Continued on Next Page

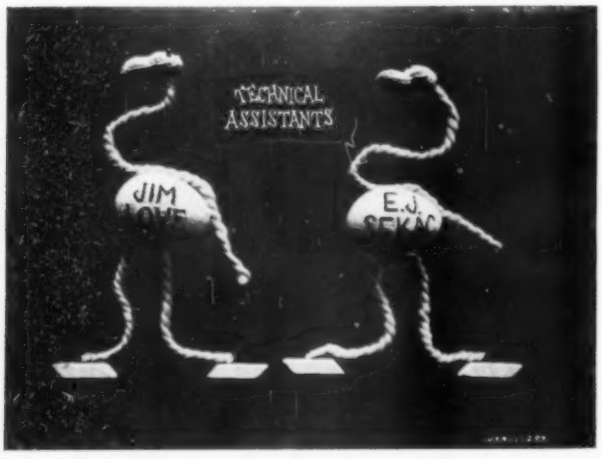
DIRECTOR BILL JUSTICE, seated left, arranges a new setup on the special animation camera stand while animator-stylist X. Atencio, on platform at rear, and cameraman E. J. Sekac lend their assistance during filming of Walt Disney's "Noah's Ark."



THROUGH MAGIC of animation and stop motion photography, two peanuts, two Easter eggs, four erasers, and four strips of pink yarn metamorphose into two flamingos carrying the names of the Technical Assistants on production of Walt Disney's "Noah's Ark."



XAVIER ATENCIO, Disney animator, deftly moves with a tweezers the components arranged before the camera on a plate glass panel to produce the animated credit title pictured below.



THE FINISHED credit title. Gradually the bits of yarn, and the peanuts, erasers and Easter Eggs fall into their proper places to form the composition. Each step of animation was charted in advance and each movement of the components between the single frame exposures was meticulously executed to give near-lifelike action to the characters.

appear in the picture. "We went to the dime stores with a basket and wandered among the counters, picking up anything that seemed to us to have possibilities," he said. "When we approached one cashier, she wanted to know if we were stocking a dime store of our own."

A special camera crane was constructed to photograph the action. As Atencio and Justice put the hand-made actors through their paces before the lens of the stop-motion animation camera, the progessive movement was photographed a frame at a time. This camera stand differs from the conventional one used for cel-and-background photography in that the camera can be rotated, freely when necessary, a full 180 degrees. It also features a different type table which comprises one or more panels of highly polished plate glass on which the action is staged and animated.

On these glass panels, laid over painted backgrounds, Disney technicians arranged the characters and animated them by moving the figures—or their body members—a fraction of an inch at a time between camera exposures. In photo on this page, animator Atencio may be seen, tweezers in hand, carefully moving the arms, necks and legs of the two cranes that carry the Technical Assistants' credits. While sheer gravity served to hold many of the figures steady on the glass top during the animation steps, others had to be secured to the glass by means of adhesive tape having gum on both sides.

Guided by the story board of T. Hee, the action was shot to match the rough sketch of the story line. Lip movement also had to be taken into consideration to synchronize with the pre-recorded track of dialogue, songs and music. The precision with which action of the characters was accurately timed with the beat of the music, to give it the illusion of human performance, is well illustrated in the musical number "Love One Another," ostensibly sung and played by Noah's sons as the Ark is tossed about during the deluge. Here the bongo player's timing is so perfect and his action so natural and realistic, one is forced to take a second and more concentrated look at the player's hands to make sure it is not a live person doing the action by means of a trick shot.

Accolades for the yet unreleased "Noah's Ark," which have come to Disney and his staff of creators and animators, undoubtedly will influence future Walt Disney animated films. Of the two major productions presently before the cameras at this studio, two include several substantial sequences of three-dimensional animation. These are "Hans Christian Andersen," and "Babes in Toyland."

Disney's animation department, which today embraces a great deal more than the conventional drawing, inking, and photographic departments of his early-day animated cartoon studio, now includes an extensive experimental and construction department wherein the key animators are constantly at work developing new and interesting characters, figure components, and structural and background materials. Men like Xavier Atencio, Bill Justice, and T. Hee regularly scout the markets for new and usable materials such as papers and fabrics having unusual texture and color; also wood, plastic, rubber and other materials which can be used for a background component, or structural material for a three-dimensional character or prop.

For one of the forthcoming productions named above, the department has been experimenting in giving unique surface texture to paper by soaking it in water, crum-

Continued on Page 696

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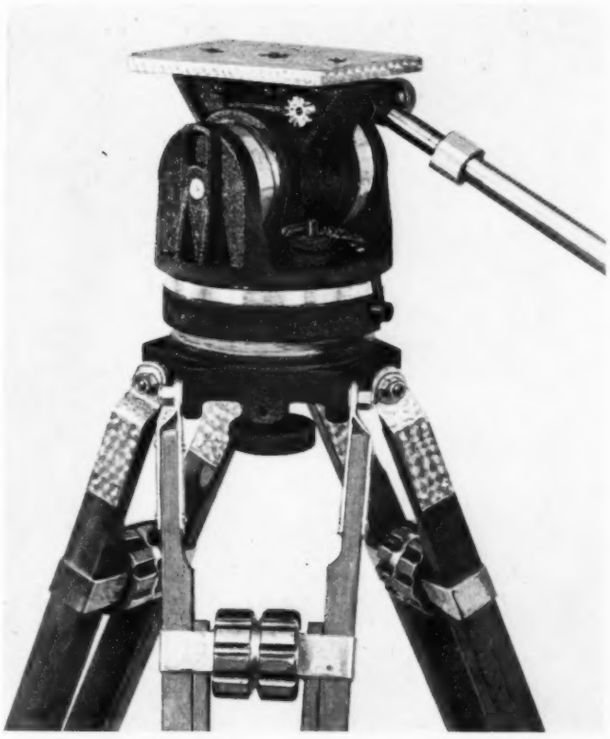

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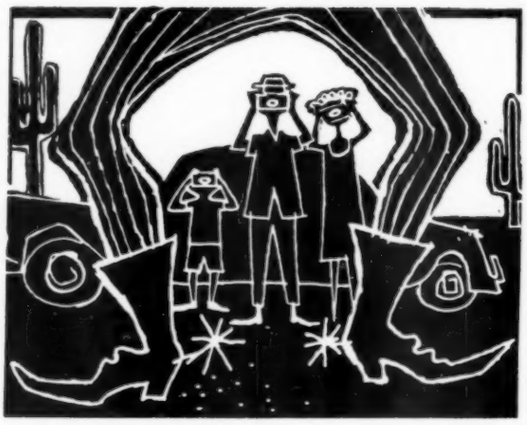

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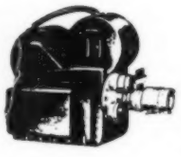

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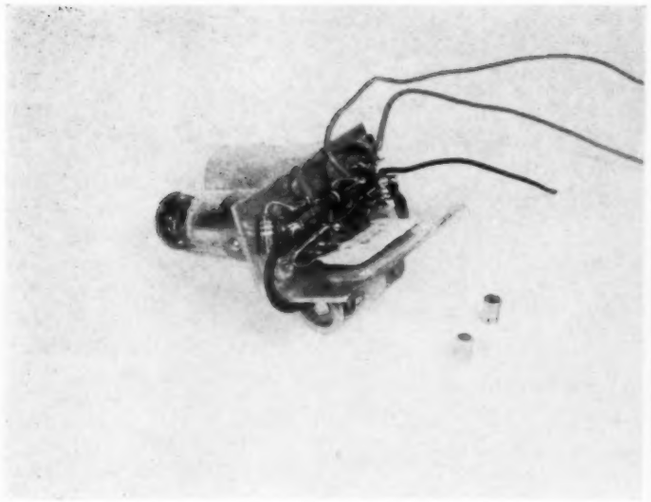

FIG. 1—The completed pre-amplifier, sub-chassis. The two small, 3/16" spacers are used in mounting the unit in the regular Cine-Voice amplifier chassis, as shown at right. (All photos by author).

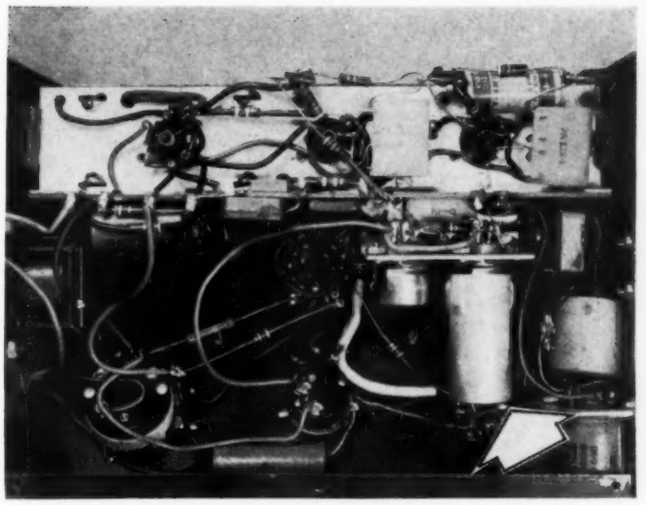

FIG. 2—Arrow points to the pre-amplifier unit mounted on underside of Cine-Voice amplifier. Here, one of the tubes of the pre-amp has been removed. New input transformer is at lower right.

2-Mike Convenience With A 1-Mike Amplifier

A do-it-yourself project that enabled the author to utilize his single-input Cine-Voice amplifier to handle two microphones for newsreel work.

By GEORGE J. YARBROUGH

United Film Productions, Orlando, Fla.

WHEN USING OUR 16mm single-system sound camera, more than once we have encountered the need to mix more than one source of sound or to record some high level source not equipped with its own level control. The amplifier for the Auricon Cine-Voice camera has but one microphone input and one high-impedance or "bridging" input, and the latter has no provision for volume adjustment.

It was suggested that our problem could be resolved by using low-level mixing, i.e., using variable "H" or "T" attenuators ahead of the microphone transformer. But we had to rule out this suggestion for several reasons: 1) the attenuators are expensive; 2) two such units would introduce 6 db signal loss (whereas we needed all the gain we could get!); 3) low-level mixing tends to become noisy after awhile; also our problem was further aggravated by the salt air exposure encountered when working at Cape Canaveral; and 4), the suggested solution would still not give us control over the high impedance output.

Inasmuch as our Auricon Cine-Voice amplifier was both rugged and proved, we decided to utilize it and add a second complete input channel. This would provide us with the necessary control over equalization as well as afford control over the gain of the bridging input. By using "hi-level" mixing, we could use inexpensive carbon attenuators (volume controls) in a common parallel network. (This same scheme is used in the Cine-Voice amplifier, but there is no provision for varying the resistance in the number two channel.) This type mixer circuit has the same insertion loss as a "low-level" type mixer; however, this has already been compensated for at this stage of amplification. Our new preamplifier has the same gain as the old one and the fixed-resistance has merely been replaced with a variable one. There is a maximum theoretical limit of 2.5 db interaction in this type circuit. However, as the tube impedance is less than that of the load (level control) the interaction is much lower and not at all objectionable.

The only real problem involved in adding the new preamplifier was finding a place to put it. We settled on building it compactly on a sub-chassis, as shown in Fig. 1. The preamplifier is shown mounted within the regular Cine-Voice amplifier chassis in Fig. 2. In mounting, 3/16" spacers were used so that the edge of the new unit would not contact bottom of the amplifier case. And as an extra precautionary measure, a small piece of sponge rubber was placed on the bottom of the case. The "tongues" of the regular chassis (the part of

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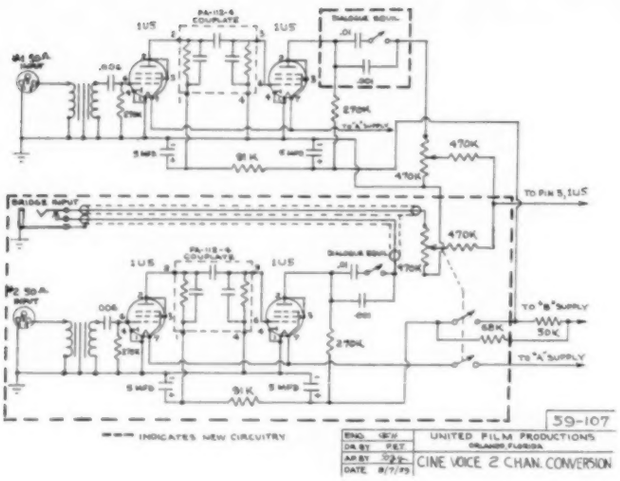

FIG. 3—Wiring diagram of the Auricon Cine-Voice amplifier showing, by means of the dotted lines, the new circuitry involved in the addition of the new pre-amplifier.

the chassis in the shock-mount) were bent slightly to compensate for the added weight of the new preamplifier.

The new level control was mounted in a hole previously occupied by the variable equalizer (tone control), which was replaced with two switch-operated units having simple "in" and "out" positions approximating the extremes of the old control. When the switch is off, or open, the equalizer is "in".

A closed-circuit jack was installed for the high-impedance input; the insertion of a plug in this jack disconnects the sound channel pre-amplifier, which eliminates the noise generated in the unweighted stage. The equalizer switch has no control when this jack is used, so that anything recorded is done "flat." The two equalizer switches and the closed-circuit jack may be seen in Fig. 4. Note that the coupling capacitors are mounted on the switches, enabling the run of the plate lead to the switch. The only shielding used in this modification is the run from the switches to the gain controls and jack. (As these are high-impedance sources at this point, the shielding was done to eliminate cross-talk).

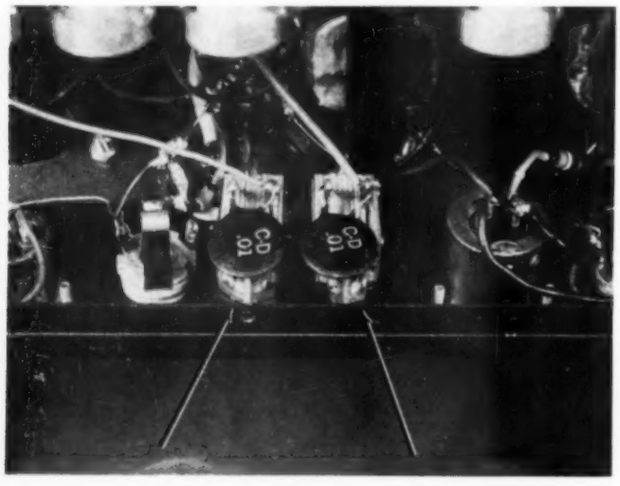

FIG. 4—Equalizer switches (arrows) and the closed circuit (high-impedance input) jack, to the left. Coupling capacitors are mounted on the switches and shielded cable extends to the level controls.

The input transformer for the new channel was mounted on an aluminum bracket next to the normal one. Although any 50-ohm-to-grid transformer will work, the same unit as used by the Auricon factory is recommended, which will insure both channels being uniform. As the transformer used has little shielding, it was critical as to orientation. There was some internal feedback which would cause the unit to oscillate when using maximum gain in the new channel. Turning the transformer in the mount eliminated this.

The SPST switch, which can be seen mounted on the rear of the second channel level-control, was later replaced with a DPST switch. The former merely switched the filament power on and off, and when the second channel was switched on, the plate voltage for the original stage was consequently lowered, due to the increased load. The second set of contacts merely parallel another resistor, thus allowing both the original and the new stage to operate with the proper plate supply. It was observed that no further capacitive de-coupling was necessary regardless of the settings of either level controls.

While it is not entirely necessary to provide a switch on the new preamplifier, it does offer the advantage of conserving battery life whenever only one microphone is used, because in such instances the batteries are not feeding the pre-amp's tubes.

Wiring of the added unit is not particularly critical as there are no A.C. hum problems to cope with. Fig. 3 is a diagram of the Cine-Voice amplifier, which shows the old and new stages and areas requiring wiring changes. Relatively simple to construct, the new unit more than proved its ability to provide the flexibility and convenience we desired at nominal cost. It should be added here, however, that the most critical professional attention should be given to the assembly of the new unit and particularly to the wiring. Successful operation cannot result where there has been careless soldering (soldering of cold joints, etc.) or wrong placement of the components. Also, it should be pointed out, that the modification of the Cine-Voice amplifier outlined here is not available from the factory (Berndt-Bach, Inc., Hollywood). All the parts required for the modification are itemized below:

1 Aerovox PA-112-4 or Centralab PC-81 triode couplate
1 .5 megohm audio taper control with DPST switch
1 91K ½-watt 5% resistor
2 270K ½-watt 5% resistor
1 68K ½-watt 5% resistor
2 5 mfd. 50 WVDC electrolytics
2 .01 mfd. ceramic capacitors
2 .001 mfd. ceramic capacitors
1 .006 mfd. ceramic capacitors
2 TS102C01 7-pin shielded tube sockets
2 Tube shields for above
2 1U5 tubes
1 Closed-circuit jack
2 SPST bat-handle switches
1 50-ohm-to-grid microphone transformer, Auricon T3194

END

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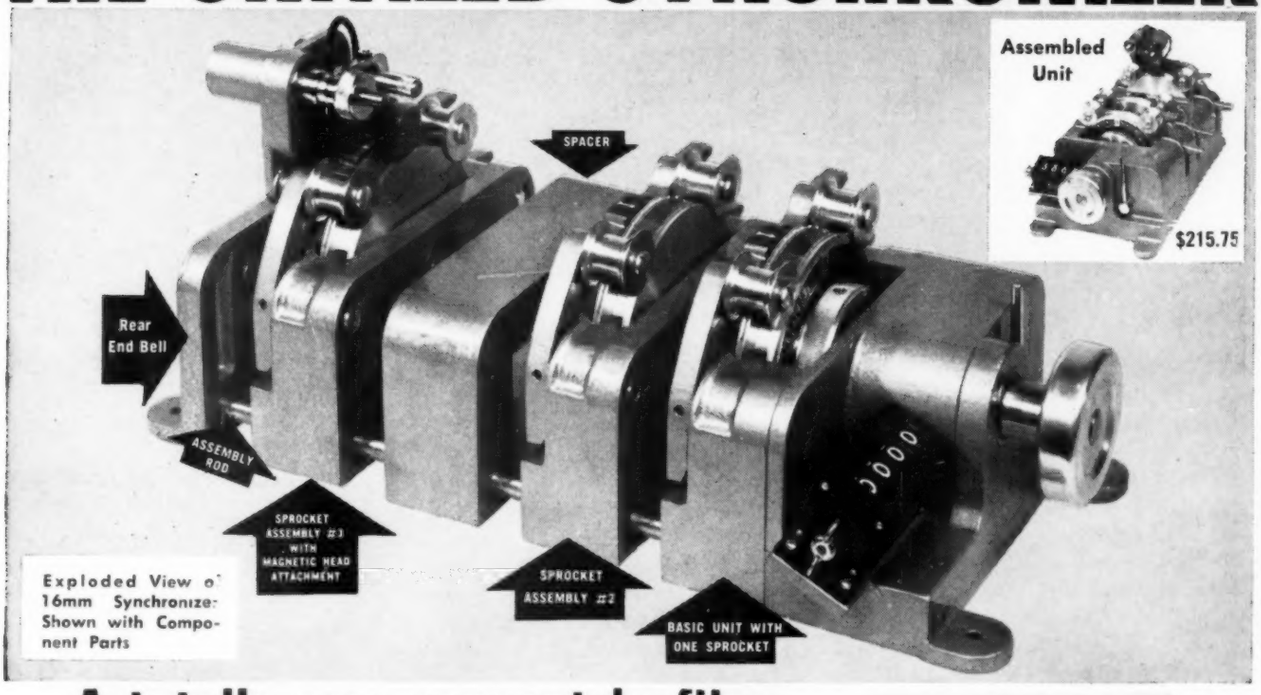

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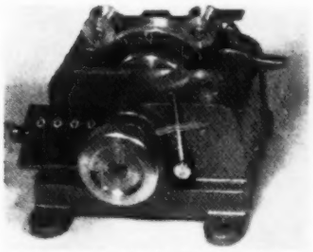

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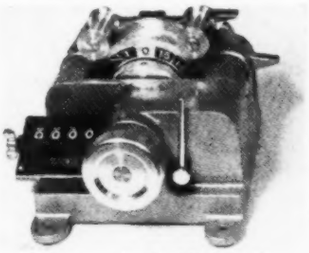

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Motion Picture Cameras | *Part VI*

AURICON PRO-600

Simplicity and versatility of this sturdy but light-weight single-system 16mm sound camera makes it ideal for in-plant industrial film production as well as television newsreel filming.

THE SELF-BLIMPED Pro-600 equipped with Auto-Parallax viewfinder, 3-lens turret, and lens-and-turret blimping hood. The 600-ft. film magazines are standard equipment.

THE AURICON PRO-600 16mm single-system sound camera, with its practical 600-foot film capacity, was designed to meet the needs of the professional cinematographer for whom the Auricon Cine-Voice (described in *American Cinematographer* for August) is too limited in film capacity or for whom the larger Auricon Pro-1200 is beyond the available budget.

The Pro-600 provides up to 16½ minutes of sound-and-picture recording at the standard s.o.f. speed of 24 f.p.s. This capacity is adequate for a wide range of technical, industrial and TV station film production needs. Like the Cine-Voice camera, the Pro-600 records sound and picture simultaneously on the same strip of film. It may also be had without sound components for use as a silent camera or for double-system sound-film production.

The Pro-600 was originally conceived as a 400-foot Cine-Voice camera. But while it was still on the drawing board, the burgeoning television industry indicated an increasing need for a rugged, lightweight single-system sound camera for newsreel photography that would load more than a couple hundred feet of film. Berndt-Bach engineers revamped their plans for the camera, scrapped the 400-foot magazine in favor of one holding 600 feet of film, and added several additional features such as ground glass focusing and a camera heating unit. The improved Pro-600 was introduced in April, 1955.

Today, the Pro-600's basic features are still its salient ones. These include: soundproof case for completely quiet studio operation; exclusive Electromatic film take-up; synchronous motor drive; critical ground glass focusing (for 3-lens turret installations); and pushbutton on-off switch coupled with safety interlocked film flow mechanism. The shutter is of the rotating disc type, with a 173° opening that gives an exposure of 1/50th sec. at 24 f.p.s.

A choice of three finder doors is offered which provides unique flexibility in selecting and using any one of three view finders available for the Pro-600 camera. One type mounts the Auricon Auto-parallax finder, another the standard Auricon finder, and the third, an interlock zoom-type finder designed for use with zoom lenses.

In addition there is a Tele-finder optical system which affords a 10-times magnified view of scene when shooting

DATA

AURICON PRO-600

16mm Single-System Sound Camera

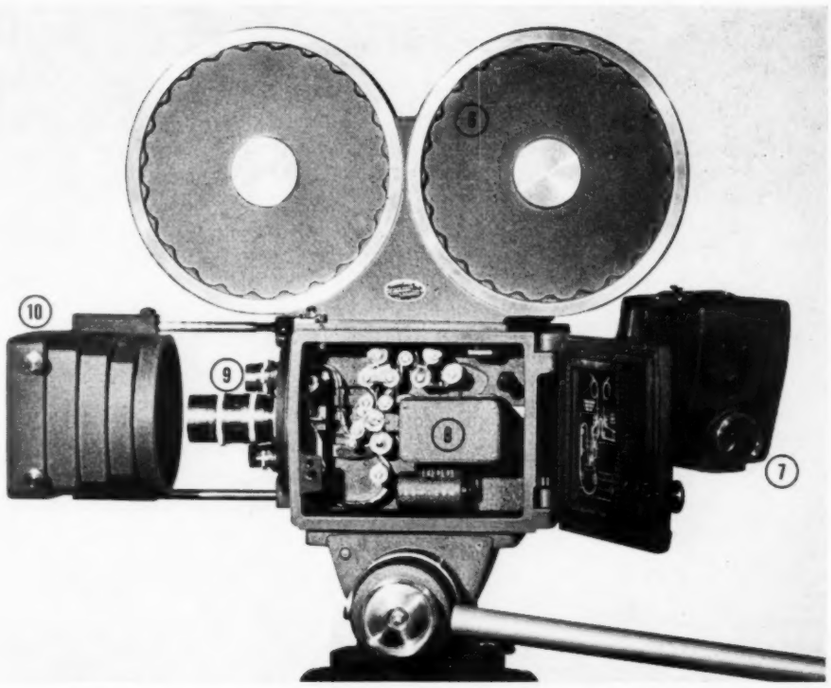
Film Capacity:	600 feet.
Type Drive:	115-V, 50- or 60-Cy., AC synchronous motor. Also operable on converted battery power. Separate torque motor drives film takeup.
Shutter:	Rotary disc, with 173° opening, gives1/50 sec. exposure at 24 f.p.s.
Focusing:	Manual with lens footage scale. Critical ground glass focusing provided on lens turret installations.
Viewing:	Three types of finders available—one offering parallax adjustment — provide for mattes to match field of lenses used. On cameras with turret installations, a Tele-finder system is included.
Lenses:	Takes C-mount lenses—others with appropriate adapters. Optional lens turret is non-divergent, accommodates three lenses.
Sound System:	Choice of three types of galvanometers for variable area or variable density recording. Installation for magnetic recording also available. Amplifier-mixer unit and batteries for sound system contained in separate case.

with telephoto lenses on a turret-equipped camera. In this operation, viewing is by means of an eye-piece extending from back of camera. Although this optical system extends through the heart of the camera, the scene is viewed not through the taking lens but through a matched Tele-finder objective lens mounted in the turret plate adjacent to the taking lens.

One of the Pro-600's important features is the Electromatic take-up. Here a separate torque motor—whose torque increases as the camera's take-up film load increases — makes possible the camera's 600-foot film load without imposing undue burden on the camera motor.

To provide a dependable, unfluctuating film flow without the need for friction clutches or slipping belts, a small amount of tension is applied to the take-up spool of the 600-foot magazine. This tension continues for a few seconds after the camera drive motor is turned off, after a take. In this way, all film is kept taut and loops are maintained between the sound-recording sprocket and the take-up compartment of the magazine.

When the Pro-600 is connected to a 115-volt A.C. line, the takeup motor will run at ⅓ power even though all switches are in the "off" position. This provides a small amount of pull on the take-up when the camera is threaded but not running, so the film will not become loose in the magazine during camera stops. This take-up tension is not sufficient to damage the film and may continue for long periods of time without affecting the film or camera mechanism. When the "start" button is pushed to turn on the camera motor, full power is then applied to the Electromatic take-up.



OPEN VIEW of the Auricon Pro-600, showing camera interior and its components: (6) 600-ft. magazines have Nylon lightraps; (7) Auto-parallax viewfinder extended on rails to afford access to lenses for focusing, etc.; (8) recording galvanometer; (9) 3-lens turret; (10) lens-and-turret blimping hood, which prevents any camera noise reaching microphone when filming closeups.

CRITICAL ground glass focusing is a feature of the turret-equipped models of the Pro-600. Here cameraman focuses lens by means of viewing port at side of camera.

The drive motor is actuated by the film-controlled safety switch inside the camera. Thus, in the event the take-up belt is inadvertently left off or the take-up drive otherwise fails, the camera drive motor will stop, indicating the film is not being taken up properly.

Still another safety feature is the turret safety switch, which is installed on Pro-600 cameras fitted with a lens turret, and which controls the camera motor so that it will not run if the turret is in "Focus" instead of "Run" position.

As with the Cine-Voice camera, the box or housing of the Pro-600 is made of cast "aircraft-specification" aluminum, which is precision-machined to take the various film driving and sound recording components. The camera door swings wide, affording easy access to the camera's interior for inspection or loading film. The film threading pattern is relatively simple. A threading diagram inscribed on inside surface of camera door serves to guide the cameraman in this operation.

The patented aperture plate design of the Pro-600 is an intelligent and imaginative piece of engineering, and should insure trouble-free film movement through the camera at all times. Film in the aperture moves over stainless-steel balls—an innovation designed to prevent film emulsion pile-up and to insure consistently sharp-focus exposures.

Pro-600 cameras are equipped with a built-in 25-watt electric heater imbeded in the front of the centerplate casting, near the high-speed shafts and film pull-down mechanism. This heater is thermostatically controlled and its purpose is to prevent temperature of the camera mechanism from dropping below the minimum efficiency temperature of 65° F, when used in cold weather. The heater automatically cuts off when the mechanism temperature reaches 70° F. So that the camera operator may check the heater function without opening the camera, a pilot lamp installed in the back of the camera indicates when the heater is "on." The power circuit is such that the heater element and pilot light are auto-

Continued on Page 694

Industrial Films Need Production Value, Too

Production Value gives a film class. Enhances its impact. Raises it above the level of the mediocre, nuts-and-bolts type of production.

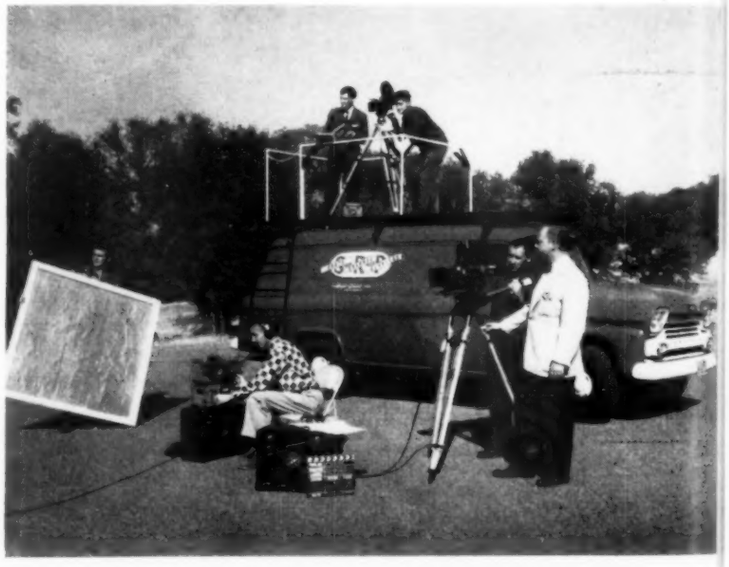
By DARRIN SCOT

THE MOTION PICTURES produced by or for business firms manufacturers, defense industries, etc., need the element of production value the same as entertainment films. Production value gives a film class. Enhances its impact. Raises it above the level of the mediocre nuts-and-bolts type of production.

Time was when the function of the industrial film was simply to make a direct statement of a certain aim on the part of the sponsor. This was done without frills, without sumptuous mounting, without showmanship of any sort. The average sponsor felt that he had a pre-conditioned audience with a built-in interest quotient. It was enough for him to make his statement, he believed, without going to any particular pains to woo the attention of those who were to view his film.

But today the story is different. We live in a rapidly moving society which makes many demands on our time and attention. Blatant advertising lures and cajols us from every quarter; TV entertains and simultaneously irritates us with its commercials; we are exhorted to see this or that form of entertainment which is "fabulous", "stupendous", "colossal"—or merely "terrific".

Today, an audience, even a specialized technical one, expects something more than the simple direct film presentation that used to suffice. Jaded by TV spectaculars and multi-million-dollar film extravaganzas, it will not hold still for dull presentations, sleazy backgrounds and unimaginative visualizations. Today the successful industrial film must compete not only with other industrial films, but with the many forms of mass entertainment which have set so high a standard of technical excellence that comparison, conscious or sub-conscious, is inevitably forced upon an audience. For this reason, production value in industrial films has become an essential in dollars and cents terms, and can literally make the difference of profit or loss to the producer. The head of an in-plant film unit is similarly put on the spot because, although he is on the company's payroll, producing films on the premises, his superiors will still judge his product by the same criteria as that of the outside producer.



ADEQUATE MODERN equipment is vital to achieving production value in film making at any level. Typical of the well-equipped in-plant film units found today in industry is the Photo Graphic Services division of Aerojet-General Corp., Sacramento, Calif.

PRODUCTION VALUE in any film requires that the same attention be given to minor shots as key scenes. Here Aerojet-General's Sacramento film unit carefully plans an insert for a company promotion film. (Photos courtesy Aerojet-General Corp.)

Exactly what is production value? In entertainment film production the term has taken on a connotation of lavishness usually exemplified by star-studded casts, expensive settings and costumes, extras by the thousand and spectacular special effects.

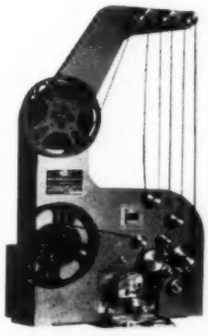
In a more realistic sense the term production value does not refer specifically to these flashy trimmings, but to an overall impression of quality conveyed by a sum total of the elements that go into a production. Contrary to popular belief such quality does not depend directly upon the amount of money that is spent on a film, but rather upon the taste, originality and ingenuity with which that money is spent.

The average commercial producer is somewhat limited by budget. Therefore, in order to get production value into

Continued on Page 692

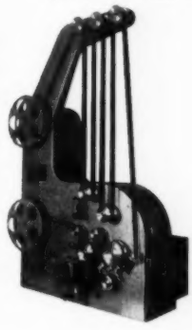
EDGE NUMBER ANY MOTION PICTURE FILM WIDTH

- ENM-16 numbers 16MM film every 40 frames. An adjustment bar permits edge numbering the film in any area (16MM only).
- ENM-16-M numbers 16MM film every 16 frames to match 35MM. Numbering can be done in any position on the film.
- ENM-35 numbers 35MM film every 16 frames. A combination 17½-35MM machine is available at a slightly higher cost.
- ENM-70 numbers 70MM film every 16 frames. (Equipped with an 80 tooth sprocket with five perforations per frame.)



ENM-16
$2675.

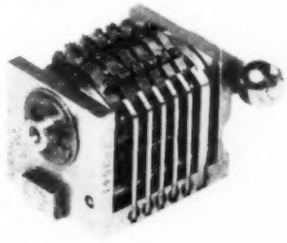
ENM-16-M
$2995.



ENM-35
$2500.

ENM-70
$3250.

- Machine can edge number rolls up to 3000'.
- Friction devices control the payout reel. A torque motor allows the film to be taken up evenly and smoothly. An adjustment knob for the torque motor rheostat permits quick adjustment to take up 1000, 2000, and 3000 foot reels.
- The impression roller is free wheeling and self adjusts itself to give a most legible number without the danger of embossing.
- A simplified inking system with an eccentric center roller in the ink well provides quick alignment for the applicator sponge rubber roller. A doctor knife in the inkwell removes all surplus ink from the inking rollers.
- There is a simple adjustment for dispensing the amount of ink required. The unit has a small brush wheel to clean the numbering element after the number is applied.
- A micro switch cuts the power when a roll of film is completed.
- A Veeder Root counter checks the film footage.
- A keeper holds the film in place for sync mark and spot coding.
- The handle in front permits the operator to manually turn the numbering block to the desired position for a number change.
- Running speed is between 80 to 110 feet per minute.



NUMBERING BLOCK

- The numbering block generally consists of two letter wheels or one number and one letter wheel manually operated and four number wheels which move automatically and number from 0001 to 9999. All numbers can be reset by hand to begin at any desired number.
- ENB-35 ($400)... Numbering block for 35MM indirect reading. Two letter wheel and four numbers.
- ENB-16 ($400)... Numbering block for 16MM direct reading. One letter and four numbers wheel or two letters and four number wheel.

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INDUSTRIAL FILMS NEED PRODUCTION VALUE

Continued from Page 690

his films he must not merely make each dollar show on the screen — he must make every dollar look like ten. This is not easy, yet it is no Utopian dream. It can be and is being done by the more successful industrial film producers, those who consistently make a profit from their pictures.

Let us take the elements that go to make up production value and analyze them one by one.

Importance of Sets

Settings are important to the mounting and overall quality of any film. Ideally, the producer will have an art director to design and supervise construction of whatever sets are desired. Usually such sets are built right in the studio—and this is expensive. The producer who books studio space by the picture—and there are many who do this—can often rent space at studios which have standing sets or large scene docks full of set units that can be assembled and dressed at very little expense. Such studios will often make "package" deals that include stage space and available sets at a flat fee. In this way the industrial film producer can achieve production value setwise without spending a large chunk of his budget.

When such arrangements are not possible it is often advisable to shoot on location in authentic or impressive actual backgrounds that can be used gratis or for a nominal fee. Whatever additional technical difficulties may arise are more than offset by the production value that may be gained from shooting in such locales.

Perhaps the greatest single factor determining production value in the industrial film is the photography. Just as the lens is more important than the camera itself, the photographic treatment is more important from the standpoint of ultimate quality than that which is being photographed. The camera cannot, of course, compensate for a poor script or faulty direction; but it can be made to do a great deal to impart visual quality to a picture that might otherwise be merely adequate. Conversely, unimaginative camera work can detract from even the most expensive and lavishly mounted production.

Considering production value strictly from the photographic standpoint, we find that the director of photography has three basic elements with which to work, in addition to the actual physical equipment which he uses to expose the film. These are lighting, composition and camera movement. If the cameraman is given his copy of the script well in advance of shooting, he can visualize the cinematic situations, discuss them with the director, examine the sets and plan in detail how he can most effectively bring the three basic elements into play for the greatest enhancement of the film.

Lighting is perhaps the most important single element in cinematography because it is the medium with which the cameraman virtually "paints" each pictorial composition. Where flat, unimaginative lighting is used in a picture, it is generally because production value is unimportant, and it is the quickest and least expensive way to light a set. The result, however, looks cheap on the screen regardless of what other visual elements appear on the film. On the other hand, even the simplest set, lighted with imagination, can take on depth, modelling and richness —a combination that adds up to quality on the screen.

The experienced cinematographer, if he really is conscientious, knows just where to throw highlights and shadows, how to build up interesting details of a set and play down the others, how to "break up" flat areas with shadow patterns, how to give actors and set elements added dimension through the use of modelled lighting, and how to impart a range of character to various sequences by varying the key of the lighting.

Composition Key Element

Similarly, *composition* is an important element often neglected in the industrial film. Good pictorial composition is simply putting the dramatic emphasis of a scene visually in its proper place. The skilled cameraman achieves this result by making sure that the lines within his frame, the perspective of the camera angle, and the pattern of movement on the screen—all lead toward the focal point of the action. The dullest monolithic form can be made interesting by a fresh and imaginative camera angle — but, again, the cinematographer must be given time to pre-plan his angles so that he is not forced to follow the unimaginative procedure of simply setting up his camera and shooting each scene from a straightforward, undramatic angle.

The third element, *camera movement*, is usually thought of as an "expensive" item, since moving camera shots take time to set up, rehearse and shoot. This seeming extravagance is, however, outweighed by the fact that it is often possible to link together, by means of the moving camera, five or six scenes which would otherwise require separate camera set-ups. Moreover, there is achieved a certain smoothness of continuity of the sort usually associated with the best professional cinematography.

Moving The Camera

In Hollywood, moving camera shots are accomplished with expensive dollies and camera cranes, some of them motor-driven. A few of the larger industrial film producers own such equipment or have budgets that will stand the rental of same. Many producers, however, avoid the use of the "fluid" camera because they are under the impression that such elaborate devices as cranes and dollies are necessary to achieve them. In actuality, almost any vehicle that has four wheels and is capable of supporting the weight of the camera and operator can be used. Even a child's toy wagon has been used more than once by imaginative cameramen to make an effective moving camera shot. Other vehicles, such as warehouse dollies having flat platforms, baggage trucks and carriers of the type used to move bedridden patients around in hospitals can be employed for the purpose with good success. Where action is to take place over a large area, an automobile, preferably a convertible, lends itself nicely to trucking or dolly shots. The automobile can either be moved under its own power (in which case there is some risk of jerkiness or vibration) or it can be pushed by two or three men. Travel over uneven surfaces can be smoothed by decreasing the air pressure in the tires.

The producer will do well to include a dolly as a permanent part of his equipment. If the cost of a professional model is prohibitive he can build one very inexpensively out of scrap lumber and second-hand wheels. In essence, a practical dolly is nothing more than a platform on wheels, with a T bar on the back to push or pull it. The rear axle should be movable to permit dollying around corners, but there should be a

pin that rigidly centers the axle for straight-line movement. For best results, pneumatic or thick rubber tires should be used.

Miniatures, properly designed and photographed, are a means of imparting tremendous production value to a film at very low cost. They make possible a wide scope of action and background that would otherwise prove too difficult or costly to photograph. Planes can be crashed, ships can be sunk, entire oil fields can be made to explode into flames—and a myriad of spectacular effects can be achieved, all at negligible cost through the use of miniature sets and props.

To enhance the illusion of "realness," miniatures should be photographed at increased camera speeds—anywhere from 64 frames per second to 128 frames per second, depending upon the size and scale of the miniature. Whenever possible natural backgrounds should be used. A wide-angle lens will exaggerate the perspective and make relative distances seem more realistic in terms of the miniatures.

When photographing miniatures outdoors the most realistic camera angle is just above ground level, which will approximate the point-of-view of a spectator on the scene. One of the important knacks of making miniatures look real is lighting and photographing them softly. Shooting such scenes too crisply will destroy the illusion and reveal the miniature for what it is. A diffusion disc or light gauze placed before the lens will usually soften the scene just enough to create the illusion of distance.

Using Stock Shots

Well-selected library or "stock" footage often can do much to add scope to industrial films—and scope means enhanced production value. New York, Hollywood and other large metropolitan centers have commercial stock shot libraries offering footage for sale. Most such libraries will send catalogues of available footage on request, but it is usually worth the trip to select your needs personally. Library shots are sold by the foot and sometimes the prices seem rather high. But when one considers that it is possible to buy perhaps for only $50.00 a scene that cost the producer many thousands of dollars to stage and photograph, the economic advantage becomes obvious.

Perhaps your script calls for a covered wagon train, an Indian raid, an air battle between hostile planes—scenes that would more than likely be impossible for you to stage on the average industrial film budget. But they can be had for a fraction of their original production cost through film libraries. Some of the government agencies have spectacular battle scenes, footage of atom bombs exploding, etc., and will sell printing masters of same to reputable producers merely for the cost of printing. Often a producer can use a stock shot to open his picture or establish a sequence and then stage further action in constructed sets that duplicate small segments of the stock shot scene.

All of the elements of production value mentioned here are available to the average producer of business and industrial films. His resourcefulness in putting them to use will lend his films style, quality and scope that will pay off in a more professional-looking film production. For when a client sees more than his money's worth on the screen, it is a safe bet that he will be back for more of the same. ■

TRAVELING MATTES

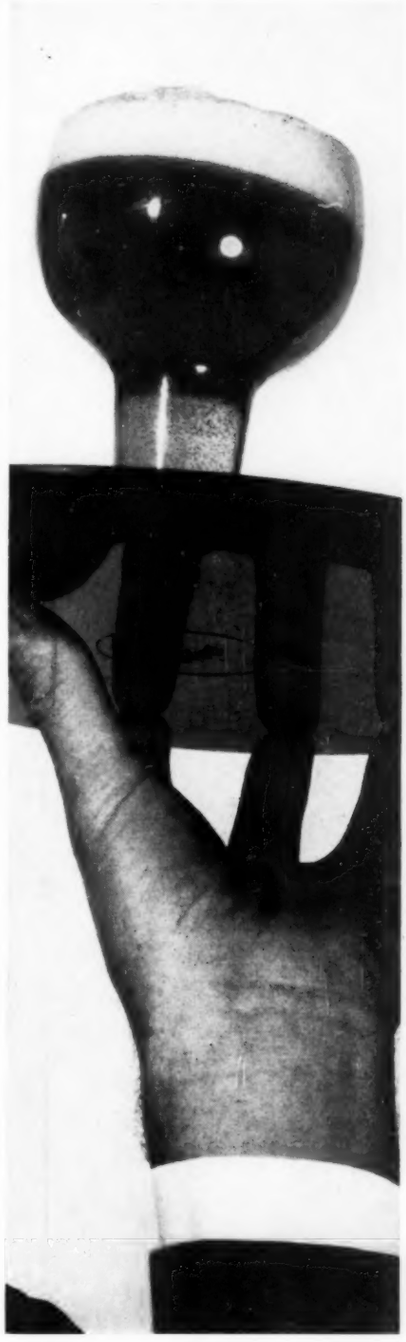
Continued from Page 678

ing of material already shot. A total of three beam-splittting cameras—one capable of high-speed photography—enable two T.M. units to remain simultaneously at work with different productions.

A traveling matte unit comprises a technician, an assistant, a beam-splitting camera with all accessories, and the amount of special lighting equipment demanded by the scale of the setups to be photographed.

The T.M. technician is provided with printed data concerning all aspects of T.M. photographic technique, this data having been assembled after many years of exhaustive experiments and tests. The technician advises the director of photography of the production unit on all matters relating to T.M. technique, and is personally responsible for lighting the backing.

The director of photography, however, is responsible for lighting the foreground. And provided only that he adhere to the level of key-lighting recommended by the T.M. technician, and insures that no excessive spill-light falls on the backing, he may employ whatever lighting arrangement he wishes. Nor is there any restriction on



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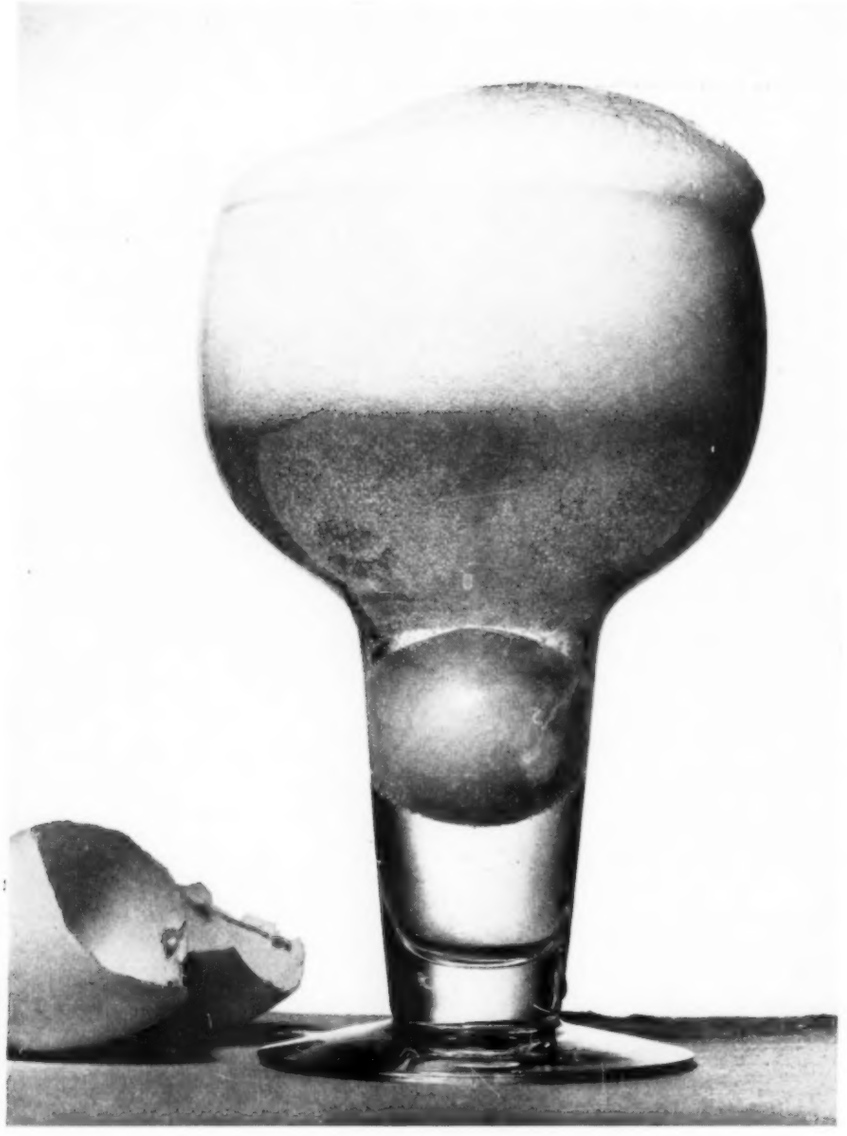

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the range of tones or colors which may be included in the foreground decor; all normal colors, and all tones from white to black are reproduced faithfully by this process.

Conclusion

The process described is engineered for producing traveling mattes on normal 35mm film. At one time it was intended to construct a beam-splitting camera for VistaVision photography, but this was not completed. There is, however, no technical reason why a double-frame (VistaVision-type) camera should not be constructed, which, together with a suitable optical printer, would enable results of enhanced quality to be obtained.

Improvements in technique and in the design of equipment are being continually made, and ways to extend the service to oversea producers are being continually studied. In its basic principles, however, the author believes that this process is a natural, and as such is unlikely to be superseded in the long run. ■

References.
1. British Patent 633,420.
2. British Patent 708,113.
3. Proc. R.P.S. Cent. Conf., London 1953, p. 325.

AURICON PRO-600

Continued from Page 689

matically turned "off" when the camera "start" button is pushed, thus preventing the camera from drawing more than 50 watts of power at any time during operation.

The manufacturer, Berndt-Bach, Inc., provides a wide range of accessories which makes it possible for any purchaser of an Auricon Pro-600 to obtain a 16mm sound camera adapted to his particular requirements. For general newsreel photography, the camera may be had with either a single lens, or with the 3-lens turret plus Telefinder objectives to match the focal length of his lenses, and the Standard Auricon finder.

For inside studio work, the Pro-600 camera may be had with the Auricon Auto-Parallax view finder plus the lens turret blimping hood, which provides completely noiseless operation. With an auxiliary sunshade mounted on the lens turret hood, the camera is further improved for general location exterior shooting.

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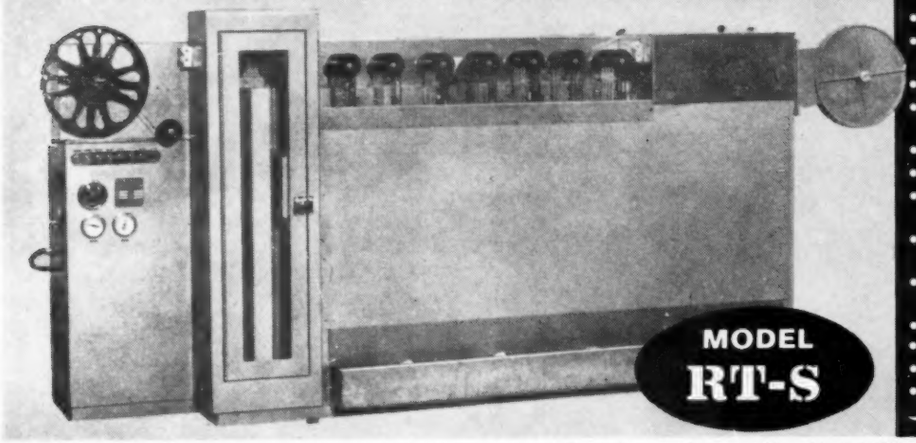

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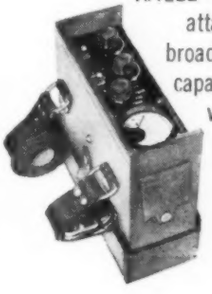
The Auricon Pro-600 may be likened to today's modern automobiles in that it may be had with a choice of accessories and components best suited to the user's needs. Once the choice of camera is made, the buyer indicates what equipment he wishes included and the factory does the rest. The type of galvanometer is an example. Berndt-Bach, Inc., offers Pro-600 buyers a choice of three: RCA type for variable area recording; Western-Electric type for variable density recording; and the

Camera Equipment Co., Inc. announces



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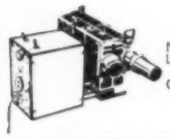

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In the current Berndt-Bach price lists, the Pro-600 equipment is grouped in a number of complete "newsreel outfits" ranging in price from $2,698.50 to $3,915 for single-system, and from $1,871.00 to $2,794.50 for double-system outfits. ■

"NOAH'S ARK"

Continued from Page 682

pling it, then mounting it on panels of cardboard to dry. The crumbling or "texturing" is varied from sheet to sheet to provide a variety of textures to represent different planes of terrain in large scene backgrounds.

While it is true that the animation of three-dimensional objects or puppets is not at all new, Disney — with the production of "Noah's Ark" — clearly takes up where his predecessors left off. Long famous as a producer of motion picture "firsts," Disney was the first to successfully combine live-action with animation back in the early twenties, with his "Alice in Cartoonland," a technique that was further developed in his films, "The Three Caballeros" and "Song of the South." Recently his "Sleeping Beauty" became the first animated feature to employ the use of 70mm Technirama, when this new photographic process was pioneered and developed by Technicolor.

Now under his guiding hand, Disney's veteran staff of creators have added a new "first" to his diadem of hits. What emerges is a tune-filled, laugh-loaded motion picture that is sure to take its place alongside other Disney achievements. But more important for the student of animation, "Noah's Ark" is an example of the ultimate of all the artistic endeavors necessary to slick, successful animation of three-dimensional figures. Go see it! ■

SEVEN SCREENS

Continued from Page 671

the U.S.A., should say to another nation, like the U.S.S.R.

"The problem was not simply to make a film," Eames points out, "but rather to decide what kind of statement a government like ours should make to the Russian people after several years of cold war. The ultimate objective was to create a relationship of understanding that might aid in bypassing a possible nuclear war. To do this, it was necessary to show life in the U.S.A. truthfully, and at the same time not flex our production muscles. We had to give credibility to a simple statement. We knew that a conventional film showing one scene at a time could not produce the desired immensity of scope. It was then that we began to think in terms of simultaneous multiple images."

There next followed experiments to determine how many images a person could see and digest at one time. The object was to present a group of images that an audience could be aware of but not analyze in a way that would involve them with the subject. In such a presentation the panorama of our way of life would be so general that an audience would assume that it had seen more than it actually had. For example, in one 12-second sequence of the finished film, 90 separate scenes of freeway overpasses flash on the screens. No one could possibly count them, but the impression is that of an infinite number.

So it was decided to mount seven 20x30 foot screens (four above and three below) along one side of the 200 foot geodesic dome, which had been designed to house the main exhibition. On these seven screens there would be flashed in precise continuity 2,200 individual scenes completely encompassing the many facets of America. There would be a dynamic musical

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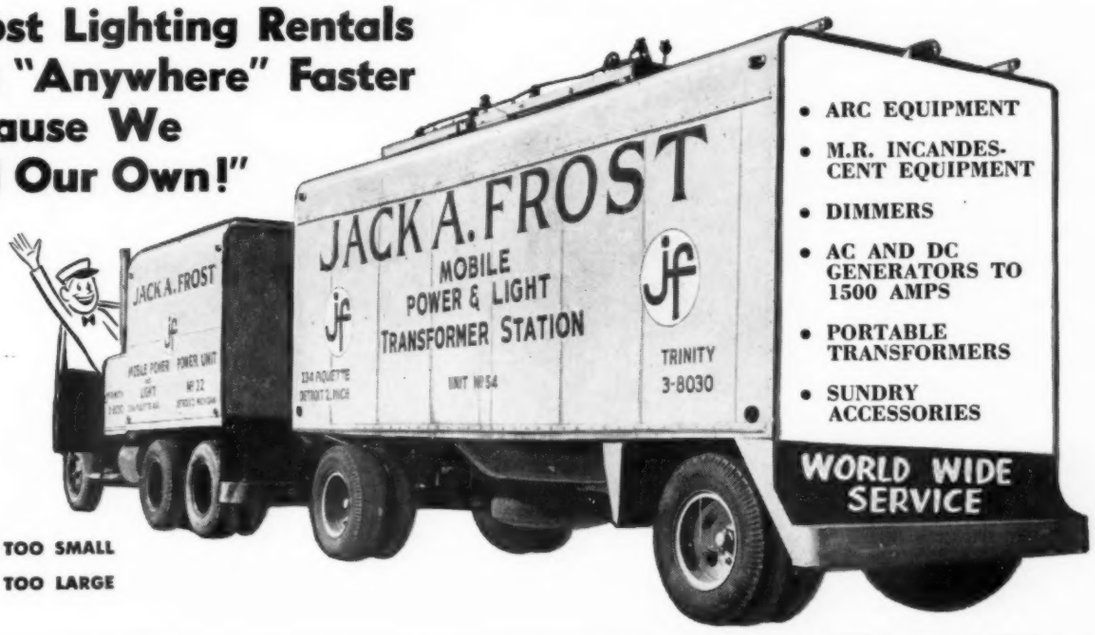

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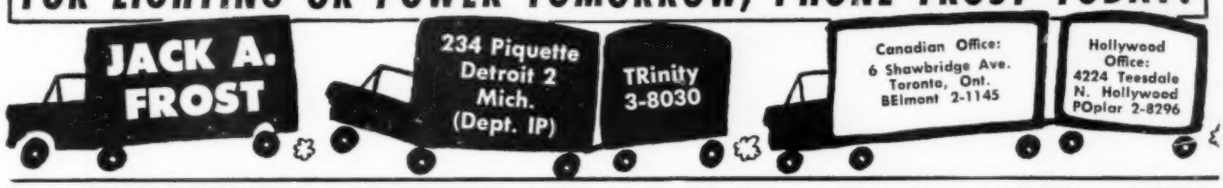
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score and a simple narration that would make no editorial statement.

The proposed plan for the project was sent off to Washington. Eames did no selling, merely presented what he thought was the best way to lick the problem. There followed three months of silence from official quarters. Then came the word: "Let's have it right now!"

Eames and his wife Ray and a corps of inspired assistants swung into action. Since the concept was original with them they had no guideposts to follow, but had to develop their own technology from scratch.

It was decided that with the exception of two sequences (an industrial montage and a scene of Marilyn Monroe winking, which was lifted from the Fox production "Some Like It Hot") the presentation would consist of still transparencies rephotographed on motion picture film. For this more than two-thousand separate shots would be needed.

Eames went first to the big national magazines, and they were most co-operative. He estimates that he examined upwards of 700,000 photographs from various sources before selecting what he needed. He obtaind about 400 pictures from Time magazine alone, (it was the first time the magazine's editors had permitted original transparencies to leave their files) and about 300 from other magazines. The remaining 70% of the pictures were shot by Eames and his staff.

With the selection of transparencies and photographs completed, a number of technical problems arose. The State Department had designated Technicolor's Hollywood Division to handle the processing and to advise on photography. Dr. Herbert Kalmus, President of Technicolor, assigned key Technicolor men to the project: Vice President Robert Riley, Fred Detmers (veteran cameraman-engineer), Gifford Chamberlain (head of Technicolor's camera department), and his assistant, Robert Moore. This dedicated team worked closely with Eames every frame of the way, and Eames gives them enormous credit for the technical excellence of the final result.

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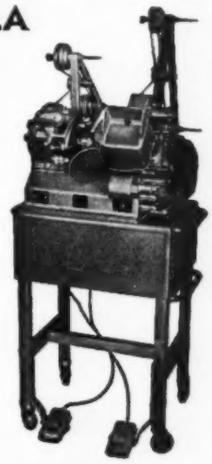

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No. 5248 was selected as the stock to be used for rephotographing the transparencies. Prints were made from color separation matrices by the Dye Transfer Process. It is a physical characteristic of color emulsions that when a transparency is rephotographed there is an inevitable build-up of contrast—the shadows block out, the highlights wash out. Technicolor technicians solved the problem by "masking" each scene. The mask, in effect, is a type of negative sandwiched in precise registration behind the original color transparency. It effectively serves to cut down the amount of exposure in the highlights and permit a greater degree of exposure in the shadow areas. It also exercises similar control in terms of hue by preventing an undue amount of color saturation. Eames himself adapted a series of Wratten CC filters to equalize the wide range of color casts existing in the vast conglomeration of transparencies.

Another problem was presented by the fact that the original transparencies were of several sizes, including 8x10's, 4x5's, 2¼x2¼'s and 35mm slides. Had rephotographing been done against spectral light it would have been necessary to tear down the entire lighting set-up, condensers and all, to zero in for each different size transparency. Instead, Eames rigged a system of diffused backlighting involving a series of photofloods in a box, with the light reflected through the transparency by means of a mirror. Exposures varied between 1 and 2 seconds per frame, with a further variation in f/ stop opening, depending upon the density of each original. The tremendous heat generated in the camera room by the lighting system was dissipated by means of blowers and vents.

Technicolor Camera Used

It had been decided to rephotograph the transparencies with a Technicolor double-frame camera having a horizontal film movement of the Vistarama type. It was reasoned that the 8 sprocket frame produced by this camera (when reduced down to the standard 35mm aspect ratio in printing) would result in decreased grain-size, better definition, reduced contrast and more precise color control. The camera was set up vertically on a mounting similar to an animation stand to permit racking the camera up and down to accommodate the various sizes of transparencies.

Approximately 95% of the transparencies were in color, but a few black-and-white shots were included for specific effect. Eames believes that when dealing with scenes which have an immediate news value a certain documentary type of statement can be more effectively made in black-and-white than in color.

A & B Roll Editing

After all photography was completed, the complex editing of the 35mm color film began. Each scene had to be cut, not only in relation to the scenes that preceded and followed it, but also in juxtaposition with the scenes that were to appear at that same instant on the other six screens. It was a matter of editing horizontically and vertically at the same time. Editing was done on A & B rolls (with a C roll added to accommodate the black-and-white shots) in order to facilitate dissolves and fades. Actually there are few dissolves in the film—mostly straight cuts were made to preserve the staccato tempo and percussive quality desired. Dissolves were used only to achieve certain changes of mood or where it was desirable to have one image flow into another to create a particular relationship.

"We had planned many tricky effects," Eames observes, "but we discovered early that if we expected to pump out a lot of information in a short space of time, we'd better stick to the simplest, most direct kind of statement, with no tricks."

Concurrent with the editing, a dynamic musical score was written by composer Elmer Bernstein. Ordinarily he would have waited until the cutting was completed, but time was of the essence, so Eames prepared a sequence chart indicating the emotional peaks throughout the script. Bernstein worked from this chart and, having seen some of the picture material, prepared a piano sketch which he later expanded into a full score.

"Elmer Bernstein did a superhuman job," Eames comments. "We were committed to a deadline date. Elmer had to write his score while things were still coming together. He'd never heard it—we'd never heard it. Then suddenly he was faced with a recording session—35 musicians, and time flying by. He's great with this kind of challenge, a real craftsman. I just don't think that composers in fields other than film know what craftsmanship can mean. I never cease to be amazed at this craft."

Music was an integral part of the production, not just background. The score and the visual image are so precisely integrated that scene changes fall right on the beat—or *almost* on the beat. Actually, if picture and music were cut simultaneously, the image would seem to lag slightly behind the beat. So each image was cut three or four frames ahead of the beat in slow sequences, and two frames ahead in sequence of a faster tempo.

The sound was recorded on a magnetic stripe on the edge of one of the seven picture prints. For protection, an optical track was also printed on another film.

The project had been started in February. It was now July. For Charles and Ray Eames and crew the final ten weeks had been a frenzy of activity without a single day off. During that period they never left the studio before one o'clock in the morning. Now the deadline was upon them. The Technicolor staff burned midnight oil to get the answer prints out. On a Friday they turned the finished reels over to Eames. That night the transfer of the final sound track was made on to the magnetic stripe. On Saturday the prints were checked, double-checked and put into cans. On Sunday Mr. and Mrs. Eames planed out over the Pole for Moscow. They carried with them 250 pounds of film. They held in their laps the reels containing the magnetic tracks in order not to run the risk of having those tracks placed near a generator that might erase the sound.

Seven Screens Used

In Moscow seven huge screens had been mounted in the dome of the exhibition hall. Four large theater speakers were placed behind the screens. Twenty-four smaller speakers were mounted in a circle around the dome. At first there seemed to be a good deal of acoustical echo, but with the crowd filling the hall—4,000 standing at each screening—the sound was effectively dampened. The track was deliberately played at a high sound level in order to relate the sound with the grandeur of the visual presentation.

Projection was accomplished by means of seven Simplex projectors set up side by side in a single booth. Critical synchronization was effected by interlock motors linking all of the

machines together. A crack American projection team, the same that had installed and operated the Circarama presentation at the Brussels World's Fair, was in charge of the Moscow screening of "Glimpses of the U.S.A."

How was the film received by the Russians? "It was more than a little effective," Eames modestly admits. "The audience during the first four days was composed almost exclusively of party members. They watched the film with intense interest. But subsequent audiences allowed their emotions to show. They were not an applauding crowd, but their 'oh's, and 'ah's' all came in the right places. Couples stood close together, husbands' arms about their wives. We could see the women turn and smile at their men as we showed pictures of an American mother kissing her child goodnight—scenes that mean people are the same everywhere."

Premier Khruschchev, usually bored and restless, watched the show with rapt attention. He appeared neither bored nor amused, but actually seemed stunned by the impact of what he had seen. Eames observed. More important, however, is the fact that 2½ million of the Russian "masses" came, saw and were enchanted by this dramatic glimpse of American life. Charles and Ray Eames deserve a salute, not only for this, but for the magnificent technical achievement resulting from their imaginative labors. ■

COLOR IN MOVIES, TV

Continued from Page 672

limitations of practicable color phosphors.

NTSC primary blue is a rather bright blue (470 millimicrons) of 85% purity, which means that its color point on the chromaticity diagram (Fig. 4, Part I) does not lie on the spectrum locus. The green primary is even less saturated (85% purity), and is definitely yellowish (535 millimicrons in dominant hue). These two primaries are fairly satisfactory, however; but NTSC primary red, even though of 100% purity, is much too orange (611 millimicrons) for a good color gamut. This scarlet-orange primary makes reproduction of deep ruby-reds impossible, and desaturates all of the purples and magentas.

The problem of TV primary red involves the excessive driving voltage required to excite known deep-red phosphors to luminescence. Differences in the three electron-gun voltages result in different image-contrast characteristics, or "gammas;" and the available deep-red phosphors require voltages greater than gamma-correcting circuits can handle satisfactorily.

The saturation deficiencies of the NTSC television gamut may be estimated by comparing the purities of the most vivid hues it is capable of reproducing with the purities of the same hues on the basis of the "colorimetric" primaries (700, 525, and 460 millicrons at 100% purity).

Color	Colorimetric Gamut Per cent purity	NTSC TV Gamut Per cent purity
Illuminant C (White)	0	0
Red (700)	100	65
TV Red (611)	98	100
Lemon (570.4)	92	87
TV Yellow (573.1)	92	88
Green (525)	100	56
TV Green (535)	91	85
Cyan (492.4)	65	51
TV Cyan (490.5)	67	52
Ultramarine (460)	100	77
TX Blue (470)	90	88
Magenta (c525)	91	63
TV Magenta (c535)	90	63
Spectrum Violet (400)	86	65

The best color-film subtractive dyes result in a gamut which is slightly superior to the TV gamut in the deep red, magenta, purple, violet, blue-violet, and blue-green regions, but somewhat inferior in certain green parts of the hue scale.

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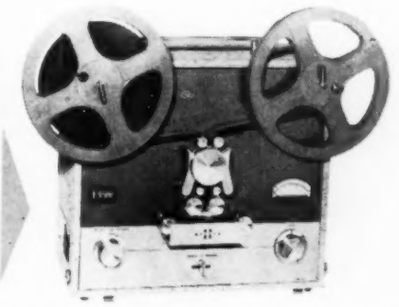

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The general superiority of the motion-picture color range nevertheless prevails only at comparatively low luminance levels. At high levels the dyes lose much of their saturation and color-filter efficiency. A bright neon sign of high spectral purity, for example, photographs as pale tint (perhaps surrounded by an "edge" of deeper color). Color TV, being an additive system, preserves the color purity at the extreme limit of brightness.

Factors of diffuse electron excitation in the color-TV picture tube, optical diffusion in the glass, and a relatively high level of ambient light under normal conditions of home use unfortunately reduce the color range of television *at low light levels* considerably below the range possible with subtractive-film pictures on adequately lighted theatre screens (10 to 30 footlamberts of brightness when the projectors are run without film). Color range, alone, is no indication of color *fidelity;* but even though such conditions as imperfections in the spectral response of color negative and in the filtering properties of the subtractive dyes would seem to militate against the fidelity of motion-picture color, a comparison of professional color movies with commercial color TV instantly reveals the very satisfactory quality of modern color-film processes.

New problems arise when color productions are filmed in the usual way for exhibition on television. Television gives good color reproduction only at high light levels; color films exhibit their purest colors at low light levels. Instead of complementing each other, however, the two processes — additive and subtractive — work against each other by "clipping" the color gamut at both ends of the brightness range.

Color Prints For TV

It has been suggested that color prints for TV use be made on film having the rather high neutral density range of 4 and printed out with a highlight density of unity (a light transmission of only 10 per cent). There are several technical objections to this proposal even though it is sound in principle.

The manner of printing the color negative need not directly concern the cinematographer, but it is safe to say that the avoidance of excessively high light levels on objects having strong color will go far toward increasing the apparent color range of the picture when it is reproduced on TV. As in black-and-white films, low-key lighting should be avoided in color filming for TV. Not only is the additive color range reduced, but TV camera tubes do not work well at low light levels. Even the use of dense prints depends upon possible future adoption of TV projector light sources considerably more powerful than the tungsten lamps employed at the present time.

It has also been recommended that additive color be used for TV color motion pictures to eliminate the high-brightness deficiencies of subtractive dyes. That this suggestion has practical possibilities is indicated by the revival of the old lenticular-film process (the original Kodacolor) and a separation-image process involving three black-and-white color-record images in the space normally occupied by a single 35mm frame (the original Thomascolor). Although beset by many practical difficulties, an additive process of some kind may eventually provide the TV color cinematographer with greater freedom in regard to permissible ranges of brightness and color.

Lenticular Film Differs

Lenticular film differs from ordinary black-and-white film only in having a series of very fine corrugations embossed on the clear base side (See Fig. 3). The film is threaded in the camera *base side toward the lens*, and a special 4-strip color filter (blue, red, green, blue) is placed over the lens. Each corrugation functions as a tiny cylindrical lens which forms four microscopic image strips across the photographed frame. Two of these strips constitute the blue record of a minute portion of the scene, one the red record, and one the green record. Projection of the black-and-white lenticular print through a similar strip filter results in an additive color image on the screen.

The disadvantages of the lenticular process include low definition, a small amount of color fringing on out-of-focus pictorial detail, difficulties in printing, and "color noise" caused by scratches and dirt in the lenticulations. A normal amount of film shrinkage is tolerated.

The separation-image type of additive process requires a special image-splitting lens fitted with red, green, and blue color filters to be used in the camera. Each of the three images photographed simultaneously in the normal frame space constitute the latent color record. Space for a fourth image exists, but is left blank. (An improvement in additive color rendition would be obtained by utilizing this space and employing a 4-color system, e.g. red at 700 millimicrons, green at 525, cyan-blue at 490, and violet at 420. Several other good combinations are possible.)

A black-and-white contact print of the multiple-image negative is projected through a similarly filtered beam-splitting lens. Like any additive-film method, this process demands a powerful projector light source to obtain a color image of acceptable brightness, but this is no disadvantage in television because the projected image is so small.

The multiple-image method is plagued by registration problems occasioned by film shrinkage and beam-splitter optical variations. Negative grain does not seem to be objectionable even though the individual color-record frames on 35mm film are approximately the size of 16mm frames.

Some television authorities are predicting that color TV will become generally widespread in from three to five years; and if that prediction holds up, many of the cinematographers who are now shooting exclusively in black-and-white for TV film production may suddenly find themselves working with color film and color lighting facilities. They will then need to turn to the more detailed, more technical, literature of color photography. The series of articles on color in motion pictures and TV, which is concluded this month, has been offered as a sort of "refresher" course on color fundamentals and their application in the production of color films for television. ■

NEW, FAST COLOR FILM

Continued from Page 660

Eastman Color Reversal Film, Daylight Type, SO-260, and the Eastman Color Reversal Film, Type B, SO-270, will be available in both 16mm and 35mm. The films may be purchased from the W. J. German Company (Fort Lee, New Jersey; Chicago, Illinois; and Hollywood, California), agents for Eastman professional motion picture films. The same films will be available through Kodak dealers under the names Kodak Color Reversal Film, Daylight Type, SO-260, and Type B, SO-270. ■

PHOTOGRAPHIC ASSIGNMENTS

Continued from Page 662

GENERAL SERVICE

MEREDITH NICHOLSON, "Border Patrol"* (Gallu Prods.) with Richard Webb. John Peyser, director.

DISNEY STUDIOS

RUSSELL HARLAN, ASC, "Pollyanna" (Shooting in Napa Valey) with Jane Wyman and Richard Egan. David Swift, director.

HARRY WAXMAN, "The Swiss Family Robinson" (Panavision & Tech.; Buena Vista release; shooting in B. W. I.) with John Mills and Dorothy McGuire. Ken Annakin, director.

WILLIAM SNYDER, ASC, "John Slaughter"* with Tom Tryon and Robert Middleton.

GOLDWYN STUDIOS

NORBERT BRODINE, ASC, EUGENE POLITO, "Loretta Young Show"* (Lewislor Prods.) with Loretta Young.

INDEPENDENT

JAMES SEELEY, ASC, Missile Test Project RCA Atlantic Missile Range, Cape Canaveral, Fla.

MORRIS HARTZBAND, "Brenner"* (Kenco; shooting in N.Y.) with Ed Binns and James Broderick. Gerald Mayer and Herman Hoffman, directors.

JOHN ALTON, "Elmer Gantry" (Eastman color; Elmer Gantry Prod. for UA release) with Burt Lancaster and Jean Simmons. Richard Brooks, director.

WILLIAM CLOTHIER, "Alamo" (Todd-AO; Batjac Prod. for UA; shooting in Texas) with John Wayne and Richard Widmark. John Wayne, director.

JOSEPH BRUN, ASC, "The Southern 500" (Darlington Films for Howco Int.; shooting in S. C.) with Rory Calhoun and Alan Hale, Jr. Paul Helmick, director.

FREDDIE YOUNG, "Gorgo" (Technicolor and wide screen; King Bros. Prods.; shooting in London) with Bill Travers and Vincent Winter. Gene Lourie, director.

KTTV STUDIOS

JACK MARTA, "Rescue 8"* (Cinefilm Inc.) with Jim Davis and Lang Jeffries. Robert Walker, director.

METRO-GOLDWYN-MAYER

JOSEPH RUTTENBERG, ASC, "The Subterraneans" (C'Scope & Color) with Leslie Caron and George Peppard. Randal MacDougall, director.

ROBERT BRONNER, ASC, "Please Don't Eat the Daisies" (C'Scope & Color) with Doris Day and David Niven. Charles Walters, director.

PHILIP LATHROP, "Peter Gunn"* (Spartan Prods.) with Craig Stevens and Lola Albright; "Mr. Lucky"* (CBS-TV).

HARKNESS SMITH, "Philip Marlow"* (Jack Chertok Prods.) with Phil Carey.

WILLIAM MARGULIES, "Not for Hire"* (Calif. National Prods.) with Ralph Meeker; "Philip Marlow"* (Jack Chertok Prods.) with Phil Carey.

DALE DEVERMAN, "One Step Beyond"* with John Newland.

Continued on Page 702

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PHOTOGRAPHIC ASSIGNMENTS

Continued from Page 701

METRO-GOLDWYN-MAYER

WILLIAM SPENCER, "Fibber McGee and Molly"* (NBC-TV) with Bob Sweeney and Cathy Lewis.

TED MCCORD, ASC, "Adventures of Huckleberry Finn" (C'Scope & Metrocolor; Samuel Goldwyn, Jr. Prod.) with Tony Randall and Eddie Hodges. Michael Curtiz, director.

HAROLD WELLMAN, ASC, "Key Witness" (Avon Prod.) with Jeg Hunter and Pat Crowley. Phil Karlson, director.

MILTON KRASNER, ASC, "Bells are Ringing" (C'Scope & Metrocolor; Arthur Freed Prod.) with Judy Holliday and Dean Martin. Vincente Minnelli, director.

RUSSELL METTY, ASC, "The Platinum High School" (Albert Zugsmith Prod.) with Mickey Rooney and Terry Moore. Charles Haas, director.

JOHN NICHOLAUS, "Rawhide"* (CBS-TV) with Eric Fleming and Clint Eastwood.

RAY FOSTER, ASC, "Secret Service"* (Pilot); Commercials*.

GEORGE CLEMENS, ASC, "Twilight Zone"* (CBS-TV).

N.B.C.

ALAN STENSVOLD, ASC, "You Bet Your Life"* with Groucho Marx. Bob Dwan and Bernie Smith, directors.

PARAMOUNT

LESTER SHORR, ASC, "Bonanza"* (NBC-TV) with Michael Landon and Dan Blocker.

ROBERT SURTEES, ASC, "Boy of Naples" (Scribe Prod.; VistaVision & Technicolor; shooting in Rome) with Clark Gable and Sophia Loren. Mel Shavelson, director.

REPUBLIC STUDIOS

GEORGE DISKANT, ASC, "Robert Taylor Detective"* (Four Star Prods.) with Robert Taylor.

GUY ROE, ASC, "Black Saddle"* (Four Star Prods.) with Peter Breck and Russell Johnson.

CHARLES BURKE, "Wichita Town"* (Four Star Prods.) with Joel McCrea; "Johnny Ringo"* (Four Star Prods.) with Don Durant and Karen Sharpe.

EMMETT BERGHOLZ, "Troubleshooters"* (Filmaster Prods.) with Keenan Wynn and Bob Mathias, Robert Altman, director; "Death Valley Days"* (Filmaster Prods.)

CARL GUTHRIE, ASC, "Wanted Dead or Alive"* (Four Star Prods.) with Steve McQueen; "Richard Diamond Private Detective"* (Four Star Prods.) with David Janssen.

HOWARD SCHWARTZ, "The Rifleman"* (Four Star Prods.) with Chuck Connors and Johnny Crawford; "Dick Powell's Zane Grey Theatre"* (Four Star Prods.) with Dick Powell.

REVUE STUDIOS

MACK STENGLER, ASC, "Leave it to Beaver"* (Gomalco Prods.) with Barbara Billingsley and Hugh Beaumont. Norman Tokar, director; commercial*.

EMIL HARRIS, RAY RENNAHAN, ASC, LIONEL LINDON, ASC, JOHN RUSSELL, ASC, "Laramie"* (Revue Prods.).

WILLIAM SICKNER, ASC, RAY CORY, ASC, "Riverboat"* (Revue Prods.).

RAY CORY, ASC, "Bachelor Father"* (Bachelor Prods.) with John Forsythe.

LIONEL LINDON, ASC, "General Electric Theatre"* (Revue Prods.).

ELLIS THACKERY, ASC, "Coronado 9"* (Revue Prods.).

JOHN WARREN, ASC, WILLIAM SICKNER, ASC, RAY RENNAHAN, ASC, NEAL BECKNER, "The Deputy"* (Revue Prods.) with Henry Fonda.

BENJ. KLINE, ASC, "Wagon Train"* (Revue Prods.) with Ward Bond.

LIONEL LINDON, ASC, JOHN RUSSELL, ASC, "Alfred Hitchcock Presents"* (Revue Prods.).

RAY RENNAHAN, ASC, ELLIS THACKERY, ASC, EMIL HARRIS, "Shotgun Slade"* (Revue Prods.).

JOHN RUSSELL, ASC, RAY CORY, ASC, "M Squad"* (Latimer Prods.) with Lee Marvin.

RICHARD RAWLINGS, "This Gun for Hire"* (Revue Prods.; shooting in San Francisco).

JOHN WARREN, ASC, "Markham"* (Revue Prods.) with Ray Milland; Commercial*.

TWENTIETH CENTURY-FOX

JAMES WONG HOWE, ASC, "The Story on Page One" (C'Scope; Co. of Artists Prod.) with Rita Hayworth and Anthony Franciosa. Clifford Odets, director.

SAM LEAVITT, ASC, "Seven Thieves" (C'Scope & Color) with Edward G. Robinson and Rod Steiger. Henry Hathaway, director.

MAURY GERTSMAN, ASC, "Adventures in Paradise"* with Gardner McKay and Weaver Levy.

WILLIAM DANIELS, ASC, "Can-Can" (Todd-AO; Jack Cummings Prod.) with Frank Sinatra and Shirley MacLaine. Walter Lang, director.

JORGE STAHL, JR., "The Girl in the Red Bikini" (Edw. L. Alperson Prod.; C'Scope; shooting in Majorca) with Mark Stevens and Joanne Dru. Byron Haskins, director.

JOE MACDONALD, ASC, WILFRID CLINE, ASC, "Five Fingers"* with David Hedisen and Luciana Paluzzi.

ERNEST HALLER, ASC, "The Voice" (Hubert Cornfield Prod.) with Edmond O'Brien and Julie London. Hubert Cornfield, director.

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JAMES DROUGHT, Commercials*

ARTHUR ARLING, ASC, Commercials*

JOSEPH BIROC, ASC, "Ice Palace" (Shooting in Alaska) with Richard Burton and Robert Ryan. Vincent Sherman, director.

JACK MACKENZIE, ASC, RALPH WOOLSEY, ASC, ROGER SHEARMAN, "The Alaskan."*

EDWIN DU PAR, ASC, "Cheyenne"* with Clint Walker.

THOMAS TUTWILER, ASC, Commercials*

WALTER CASTLE, ASC, Commercials*

PEVERELL MARLEY, ASC, Commercials,* "Rachel Cade" with Peter Finch and Angie Dickinson. Gordon Douglas, director.

HAL MOHR, ASC, Commercials*

ELLSWORTH FREDRICKS, ASC, "Tall Story" (Mansfield Prods.) with Anthony Perkins and Jane Fonda. Joshua Logan, director.

LUCIEN BALLARD, ASC, "The Life and Death of Legs Diamond" (United States Pictures) with Ray Danton and Karen Steele. Budd Boetticher, director.

JACK HILDYARD, "The Sundowners" (Technicolor; shooting in Australia) with Deborah Kerr and Robert Mitchum. Fred Zinnemann, director.

RALPH WOOLSEY, ASC, ROGER SHEARMAN, WESLEY ANDERSON, RICHARD RAWLINGS,

Continued on Page 704

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90°	1/32	1/48	1/64	1/96
80°	1/36	1/54	1/72	1/108
70°	1/41	1/62	1/82	1/123
60°	1/48	1/77	1/96	1/144
50°	1/57	1/91	1/115	1/182
40°	1/72	1/108	1/144	1/216
30°	1/96	1/144	1/192	1/288
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Continued From Page 702

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AMERICAN CINEMATOGRAPHER published monthly at Los Angeles, California for October 1, 1959.

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ARTHUR E. GAVIN,
Editor

Sworn to and subscribed before me this 12th day of October, 1959.

(Seal) Marion M. Hutchins
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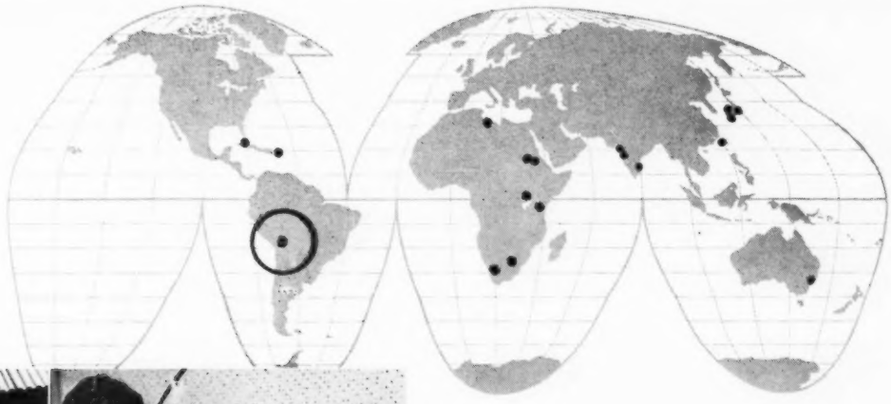

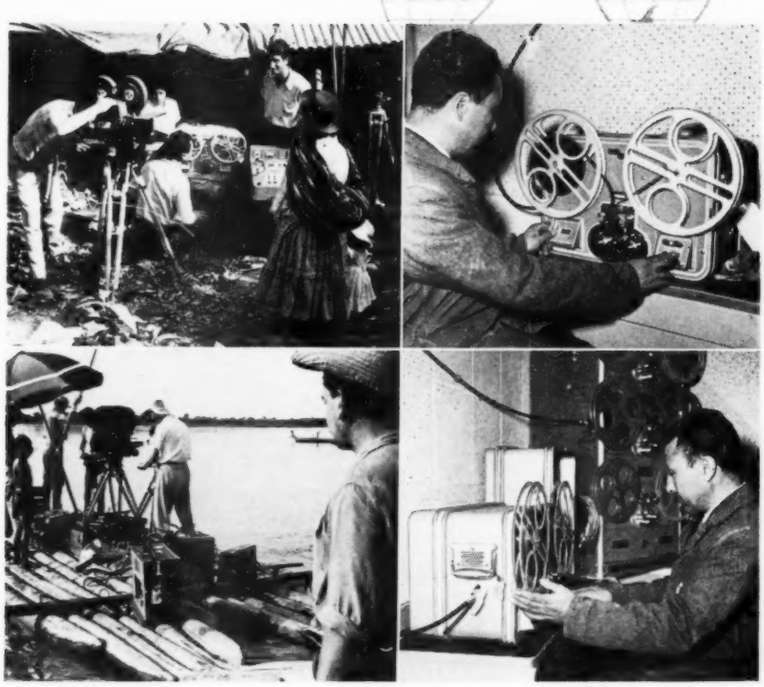

la paz

Studios of the Audiovisual Center of United States Operations Mission in La Paz, Bolivia, were established for production of documentary and educational films for both Bolivia and the U.S. Government. The AV Center sound department, headed by Mr. Rodolfo Soria, has been completely equipped with the internationally famous Magnasync-Magnaphonic Sound Systems by Casa Kavlin, La Paz.

Photo at top left shows the Magnasync Mark IX System in use during a scene from "La Colmena", produced by the AV Center. Lower-left photo is a scene during filming of "La Vertiente", produced by the Institute Cinematografico Boliviano in the Beni region of the Bolivian jungles. The Magnasync Type 5 recorder performed superbly. Other photos show Rodolfo Soria studio-recording with the Mark IX System.

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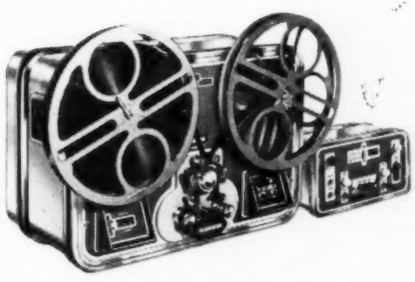

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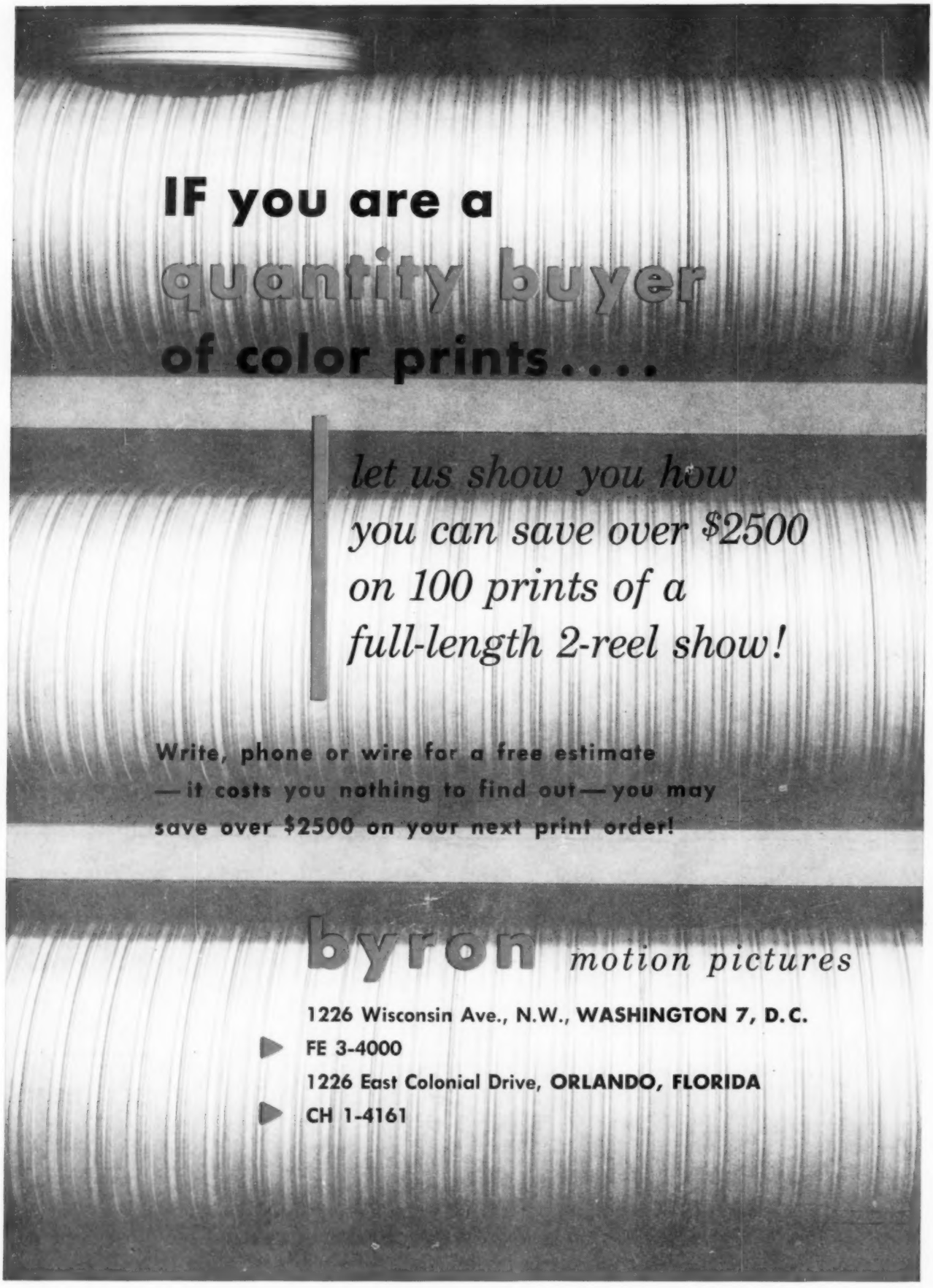
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